Lower South Umpqua Watershed Analysis

Roseburg District
South River Resource Area

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Executive Summary
Lower South Umpqua WAU

Characterization

The Lower South Umpqua WAU covers approximately 110,419 acres. Approximately 58,421 acres (53 percent) of the WAU is in nonforested conditions, mainly agricultural. Another 25 percent (approximately 27,430 acres) of the WAU are dominated by hardwoods. About 22percent (approximately 24,529 acres) of the WAU is considered to be conifer forests.

The Bureau of Land Management administers approximately 4,155 acres (four percent) of the WAU. The South River Resource Area manages approximately 2,702 acres and the Swiftwater Resource Area manages approximately 1,452 acres of the BLM-administered lands. Approximately 2,835 acres (68 percent) of BLM-administered lands are available for intensive forest management. This is about three percent of the WAU.

Timber harvesting, agriculture, transportation, service-related activities, and residential dwellings have been the dominant human uses in the WAU. The communities of Roseburg, Winston, Melrose, and Dixonville are located in the WAU.

The watershed analysis uses the format presented in the Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis. The Key Issues, Findings, and Recommendations and Restoration Opportunities summarize the information included in the watershed analysis.

Key Issues

The following issues and concerns were identified during the analysis.

Potential areas for timber harvesting on BLM-administered land in the WAU.

The amount of timber harvesting conducted in the past.

The amount of late-successional habitat in the WAU.

The distribution and condition of habitat used by Special Status Species.

Condition of Riparian Reserves (vegetation conditions and effects of roads).

Water quality.

The impacts roads have on streams due to sediment and road encroachment.

Restoration opportunities in the WAU.

Findings

Vegetation

Bureau of Land Management administered land comprises about four percent of the WAU.

About 68 percent of the BLM-administered land in the WAU is available for timber harvesting.

There is no access to some BLM-administered land in the WAU.

Soils

There are approximately 742 acres of granitic soils on BLM-administered land occurring on slopes greater than 35 percent. These soils are considered to be Category 1 Soils that are highly sensitive to prescribed slash burning.

Hydrology and Fisheries

Road densities in the WAU range from 3.84 to 6.09 miles per square mile. The road density for the WAU is 5.66 miles per square mile.

Deer Creek was listed from the mouth to the headwaters due to bacteria, dissolved oxygen, habitat modification, and temperature. The South Umpqua River was listed due to toxics, flow modification, aquatic weeds or algae, bacteria, biological criteria, dissolved oxygen, nutrients, pH, and temperature.

Wildlife

The limited amount of BLM-administered land in the WAU restricts the amount of habitat available for late-successional associated wildlife species.

Recommendations and Restoration Opportunities

Vegetation

Conduct regeneration harvests on the Matrix Land Use Allocation in conformance with the RMP.

Manage young stands, including those in Riparian Reserves, to maintain or improve growth and vigor and improve stand structure and composition.

Soils

Best Management Practices (BMPs) should be applied during all ground and vegetation disturbing activities. Along with BMPs, the Standards and Guidelines in the RMP should be implemented to achieve proper soil management. Best Management Practices should be monitored for implementation and effectiveness to document if goals are being achieved.

Hydrology

Consider conducting Rosgen stream surveys to classify stream types, characterize stream channel morphology, and identify potential stream restoration sites.

Use the regional curves developed by hydrologists on the Roseburg BLM District to predict streamflow, depth, width, and cross-sectional area of ungaged streams.

Consider changing the Subwatershed (6th field) and Drainage (7th field) boundaries. Currently, the Deer Creek Subwatershed only includes the North and South Forks of Deer Creek. The mainstem of Deer Creek is in the Roseburg West Subwatershed. The Deer Creek Subwatershed should include all of Deer Creek from where it flows into the South Umpqua River to the headwaters.

Consider planting conifers where they occurred naturally in riparian areas but are absent now.

Consider adding LWD to increase habitat complexity and help restore streams impacted by timber harvesting and road building. Thinning in Riparian Reserves would also allow trees adjacent to stream channels to grow and provide LWD in a shorter amount of time than without any management.

Use bioengineering techniques with stream restoration opportunities. Avoid using rip rap and gabion baskets in the stream channel.

Do not construct check dams in stream channels.

Monitor stream restoration projects for temperature, turbidity, sediment, and channel morphology changes.

Conduct stream surveys to help design stream restoration projects, such as removing culverts when decommissioning roads or replacing culverts on fish bearing streams.

Some roads to consider fully decommissioning or improving are listed in Appendix G. Roads within Riparian Reserves, that have been identified as causing water quality problems and in Drainages with the highest road densities would be considered first for full decommissioning.

Determine where culverts block fish passage, need to be repaired or replaced, are inadequate to accommodate a 100-year flood, and where additional culverts, waterbars, or waterdips would reduce stream network extension. Water dips or waterbars should be installed to prevent ditch flow from entering another stream. When there is a potential for water to be diverted the road crossing fill should be hardened and a water dip installed directly over the stream crossing to allow streamflow to travel over the road and back into the stream channel.

When fertilizing in the WAU, provide adequate buffers on streams and monitor activities. Where streams or other water bodies have a pH above 8.0 or in municipal watersheds, apply the fertilizer so it would not lead to an increase in pH or primary productivity in the stream.

Consider planning regeneration harvests and commercial thinnings where existing roads can be used to minimize the amount of new road construction.

The amount of forested land less than 30 years old, the road and stream densities, the amount of land in the TSZ, and the proposed project should be considered when analyzing the potential impacts of management activities.

Reducing road densities, improving roads, and identifying stream restoration projects would probably be the most effective restoration activities in the WAU. Thinning in the Riparian Reserves should be considered where opportunities exist.

Consider opportunities to adjust Riparian Reserve widths within the WAU. The Riparian Reserve Evaluation Techniques and Synthesis module should be used as a guide when considering adjusting Riparian Reserve widths.

Fisheries

Streams with fair or good habitat condition ratings, high species diversity, low gradients, and easily accessible habitat should be priority areas for watershed restoration.

Analyze the amount of soil disturbance, timber falling, and yarding within late-successional or old-growth timber stands in Riparian Reserves. Salvage activities in late seral aged stands within Riparian Reserves should not retard or prevent attainment of Aquatic Conservation Strategy objectives.

Follow NMFS guidance on timber salvaging activities in riparian areas. Salvage only the portion of tree in the road prism, leaving the portion of the tree that reached the stream.

Consider reducing road densities where peak flows have negatively altered stream channel condition and impacted the fisheries resource. Prioritize the road restoration needs based on information in the Transportation Management Objectives (TMOs). Consider decommissioning roads in Drainages containing the most acres in the Transient Snow Zone and anadromous fish-bearing stream reaches. Priorities for road decommissioning would be valley bottom, midslope, and then ridgetop roads.

Use existing roads, as much as possible, when planning land management activities in the WAU. Construct new stream crossings and roads within Riparian Reserves only when necessary.

The BLM has limited stream restoration opportunities in the Lower South Umpqua WAU. The BLM administers approximately two miles of anadromous fish-bearing stream, based on fish distribution data provided by ODFW. Approximately 1.25 miles on the Middle Fork of South Deer Creek, approximately 0.5 miles on the South Fork of Deer Creek, and approximately 0.25 miles on the North Fork of Deer Creek are considered to be anadromous fish bearing and located on BLM-administered land. The anadromous fish habitat on BLM-administered lands is located at the upper anadromous distribution limits. Due to the location and limited amount of anadromous fish habitat on BLM-administered lands, this WAU is considered to be a low priority for instream habitat restoration. However, Large Woody Debris and boulders could be placed in T28S, R4W, Section 5 on the Middle Fork of South Deer Creek. These structures would provide pool habitat and cover for fish.

Wildlife

Follow the terms and conditions from the USFWS if management activities would remove or disturb the twelve acres of marbled murrelet habitat in the WAU.

Consider conducting surveys to determine if northern goshawks are present in the WAU.

Consider conducting general surveys to locate Kincaids lupine. Kincaids lupine populations discovered should be monitored to detect the presence of Fender’s blue butterfly caterpillars.

Consider evaluating potential rocky habitat to determine if it is suitable Del Norte salamander habitat.

Consider conducting general surveys for red tree voles in the WAU.

Consider scheduling management activities, such as burning, brushing, precommercial or commercial thinning, timber harvesting, or other activities that remove or modify neotropical bird habitat so they do not occur during the breeding season between April 1 and July 30 of any given year.

I. Characterization of the Watershed

Watershed analysis is a systematic procedure to characterize a watershed. The information would be used for making management decisions to meet ecosystem management objectives. This watershed analysis follows the format presented in the Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis.

Watershed analysis is one component of the Aquatic Conservation Strategy (ACS). The other components of the Aquatic Conservation Strategy are Key Watersheds, Riparian Reserves, and Watershed Restoration. These components are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems. The Lower South Umpqua Watershed Analysis Unit (WAU) is not within a Key Watershed. Riparian Reserves are portions of the landscape where riparian-dependent and stream resources receive primary emphasis. Riparian Reserves help meet the Aquatic Conservation Strategy by maintaining streambank integrity, large woody debris (LWD), riparian shade and microclimate, and surface and groundwater systems (see Appendix H). Riparian Reserves also provide sediment filtration, travel and dispersal corridors, nutrient sources, pool habitat, and drainage network connections. Watershed Restoration would help in the recovery of fish habitat, riparian habitat, and water quality.

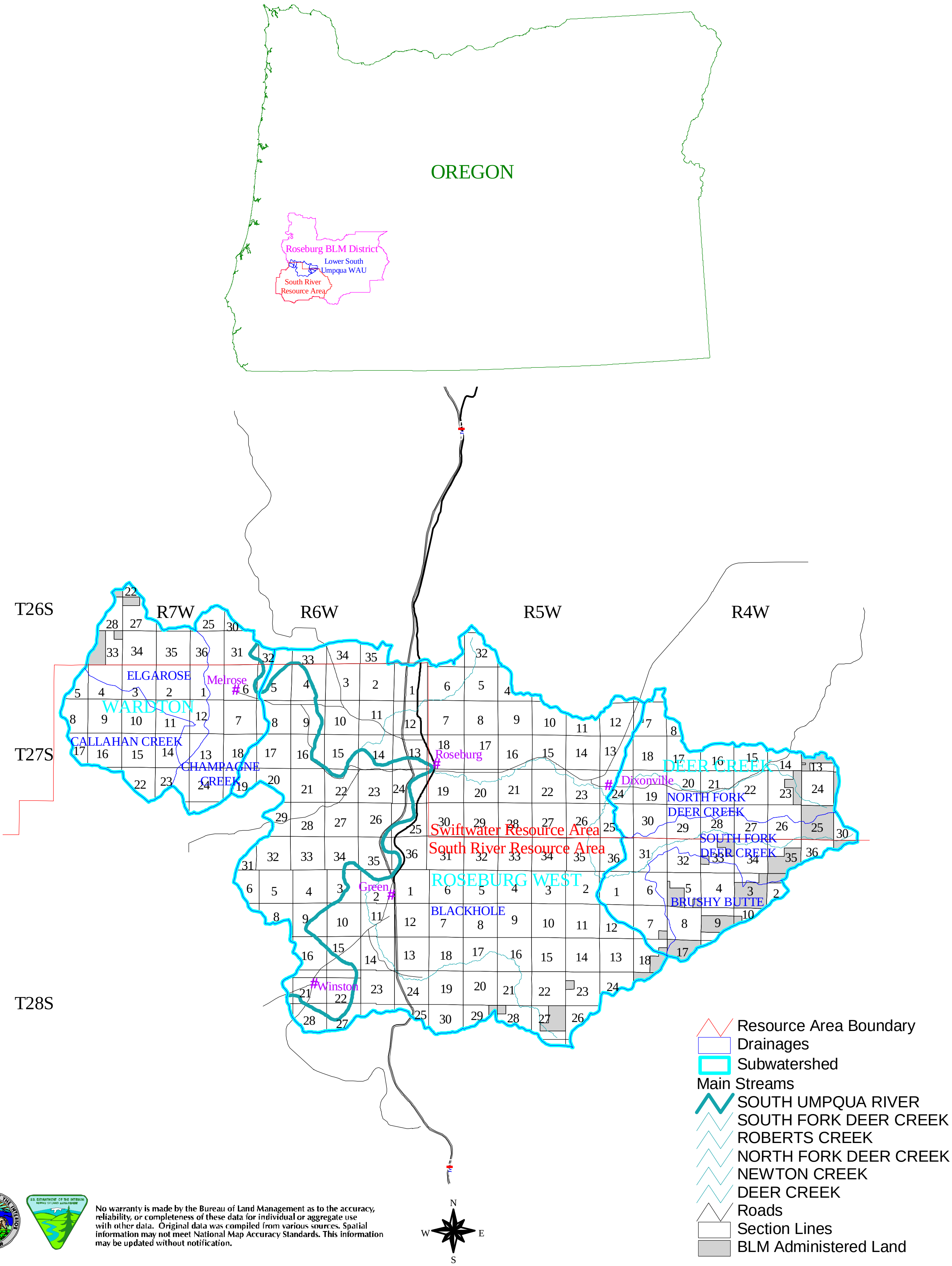
The Lower South Umpqua Watershed Analysis Unit is located in the north central portion of the South River Resource Area on the Roseburg District Bureau of Land Management (see Map 1). The Lower South Umpqua WAU also includes the south central portion of the Swiftwater Resource Area on the Roseburg District Bureau of Land Management. The Watershed Analysis Unit covers approximately 110,419 acres. Elevation ranges from about 380 feet where the North and South Umpqua Rivers meet to form the Umpqua River in the northwest part of the WAU to 3,468 feet on Lane Mountain in the eastern portion of the WAU. The towns of Roseburg and Winston are located in this WAU.

The Lower South Umpqua Watershed Analysis Unit is interchangeable with the Lower South Umpqua Watershed, which is a fifth field watershed. The fifth field watershed is the scale of analysis used when determining whether activities retard or prevent attainment of Aquatic Conservation Strategy objectives (USDI 1995). The Lower South Umpqua Watershed Analysis Unit includes three subwatersheds, which are further divided into seven drainages. The subwatersheds and their drainages are shown on Map 2 and the acres of each are listed in Table 1.

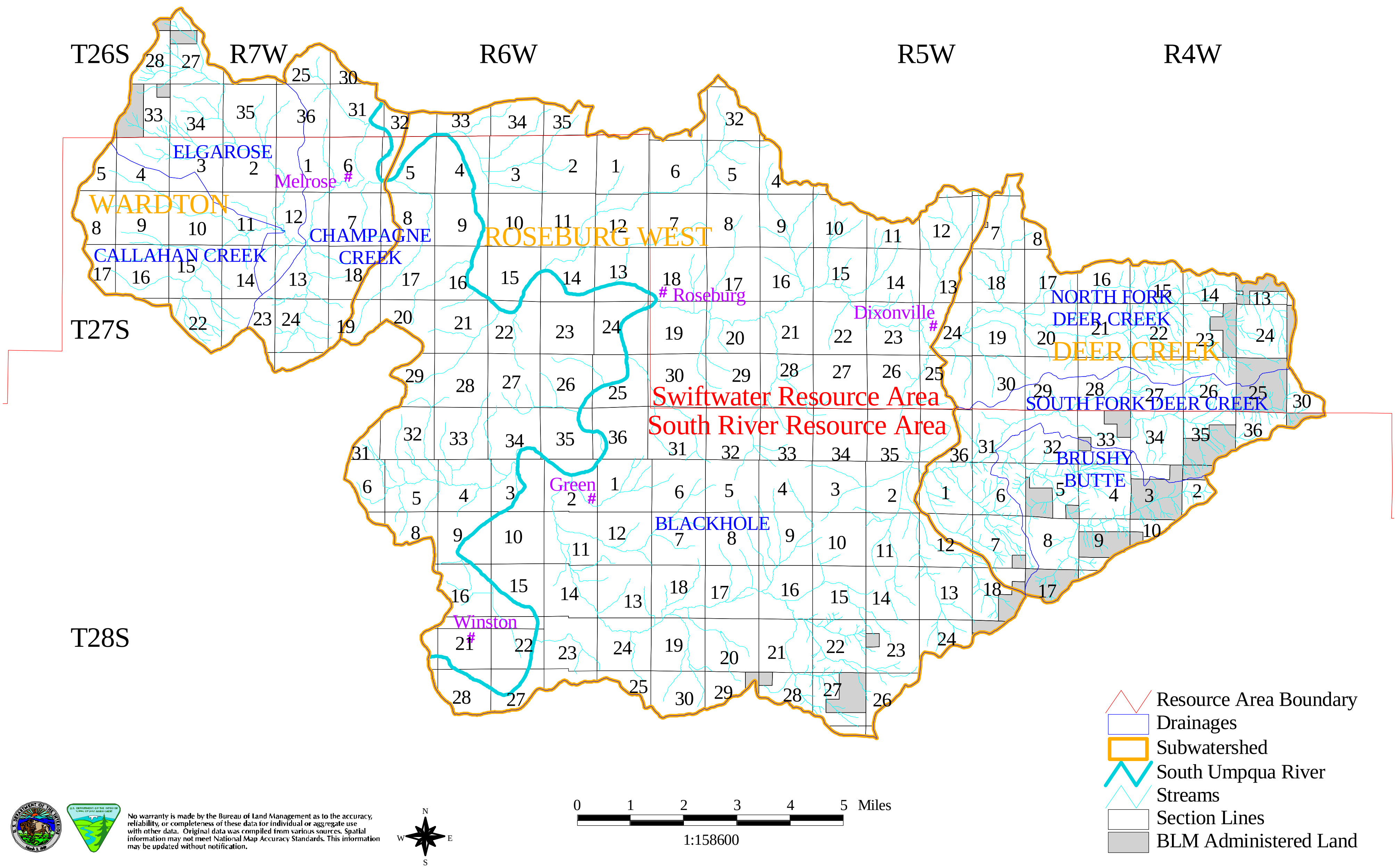
The Bureau of Land Management (BLM) administers approximately 4,155 acres (four percent) of the Lower South Umpqua WAU. The South River Resource Area manages approximately 2,703 acres and the Swiftwater Resource Area manages approximately 1,452 acres of the BLM-administered lands. Privately owned lands cover approximately 106,264 acres (96 percent) of the WAU.

Bureau of Land Management administered lands are composed of Matrix and Riparian Reserve Land Use Allocations established in the Northwest Forest Plan (USDA and USDI 1994b) and the Roseburg District

Map 1. Vicinity Map
Lower South Umpqua Watershed Analysis Unit



Map 2. Lower South Umpqua Watershed Analysis Unit
Subwatersheds and Drainages



Resource Management Plan (RMP). Matrix lands are further delineated into General Forest Management Areas (GFMA) and Connectivity/Diversity Blocks (CONN). Map 3 and Chart 1 show the percentage of GFMA, Connectivity/Diversity Blocks, and Riparian and Other Reserves and how they are distributed in the WAU. Table 2 and Chart 2 show the number of acres by Land Use Allocation.

Table 1. Acres and Percent Ownership by Drainage and Subwatershed.

Drainage Name Subwatershed Name	BLM		Private		Total Acres
	Acres	Percent	Acres	Percent	
Brushy Butte	1,306	29	3,205	71	4,511
North Fork Deer Creek	653	7	9,230	93	9,883
South Fork Deer Creek	1,176	16	6,393	84	7,569
Deer Creek Subwatershed	3,135	14	18,828	86	21,963
Blackhole	618	1	70,355	99	70,973
Roseburg West Subwatershed	618	1	70,355	99	70,973
Callahan Creek	0	0	5,415	100	5,415
Champagne Creek	0	0	6,052	100	6,052
Elgarose	402	7	5,614	93	6,016
Wardton Subwatershed	402	2	17,081	98	17,483
Lower South Umpqua WAU	4,155	4	106,264	96	110,419

Map 3. Lower South Umpqua Watershed Analysis Unit
Land Use Allocations

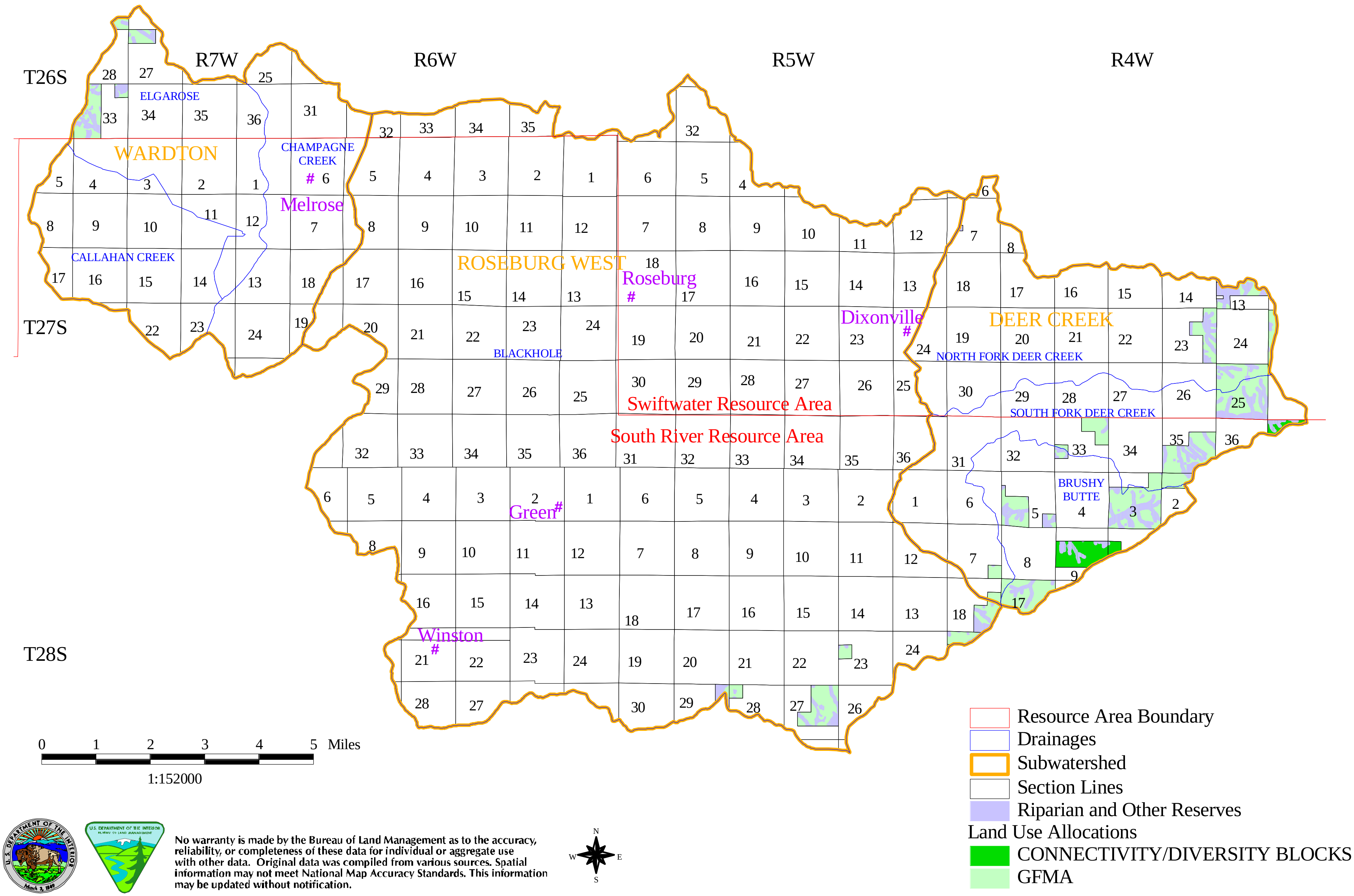


Chart 1. Lower South Umpqua WAU

Total Land Use in the WAU

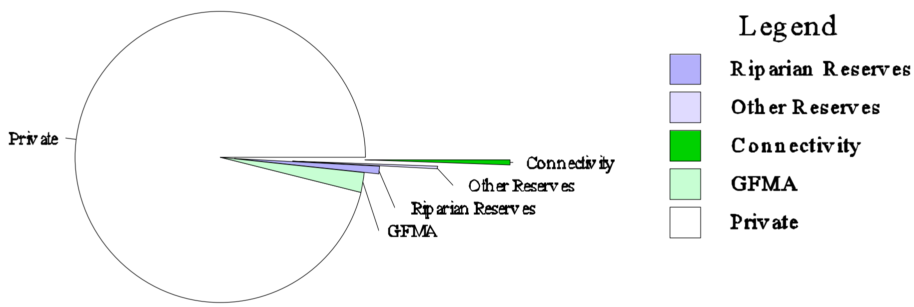


Chart 2. Lower South Umpqua WAU

BLM Land Use Allocation

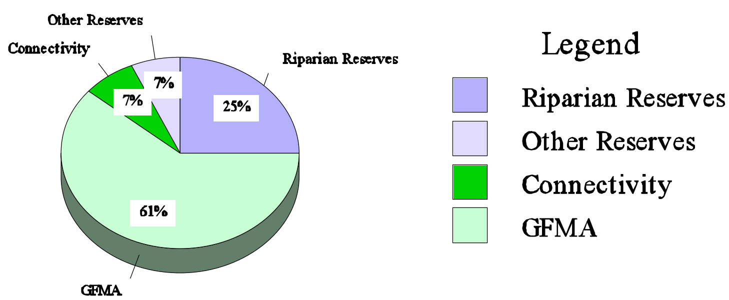


Table 2. Acres and Percentages of BLM Administered Lands by Land Use Allocation.

Land Use Allocation	Acres of BLM Administered Land	Percent of BLM Administered Land	Percent of Watershed Analysis Unit
Riparian Reserves	1,026	25	0.9
Other Reserved Areas (Owl Core Areas and TPCC Withdrawn Areas)	291	7	0.3
Connectivity/Diversity Blocks	293	7	0.3
General Forest Management Area (GFMA)	2,541	61	2.3
Total	4,155	100	3.8

II. Issues and Key Questions

The purpose of developing issues is to focus the analysis on the key elements of the ecosystem that are relevant to the management questions, human values, or resource conditions within the WAU. Areas covered by this watershed analysis receive more in-depth analysis during project development and the National Environmental Policy Act (NEPA) process. New information gathered during the Interdisciplinary (ID) team process would be appended to the watershed analysis document as an update.

A. Issue 1 - Harvest Potential

Matrix lands are responsible for contributing to the Probable Sale Quantity (PSQ). Objectives in the Matrix include producing a sustainable supply of timber and other forest commodities, providing connectivity (along with other Land Use Allocations, such as Riparian Reserves) between Late-Successional Reserves, providing habitat for a variety of organisms associated with both late-successional and younger forests, providing for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, maintenance of ecologically valuable structural components such as down logs, snags, and large trees, and providing early-successional habitat.

Key Questions

Vegetation Patterns

What are the historic and current vegetation conditions? See pages 15 through 40.

What is the current age class distribution in the WAU? Where are the early and mid seral stands in the WAU? Where are the late-successional/old-growth stands within the WAU? See Table 7 on page 25, Table 8 on page 27, Map 8 on page 26, and Map 9 on page 28.

Where are the stands of harvestable age (at least 40 years old) within the Matrix Land Use Allocation? See Map 8 on page 26, Map 13 on page 42, and Map I-1 in Appendix I.

Can the scale, timing, and spacing of timber harvest areas be adjusted to minimize fragmentation and the effects on other resources while meeting the objectives for the Matrix Land Use Allocation established in the SEIS ROD and the Roseburg District RMP? See pages 41 through 48, Map 13 on page 42, and Appendix I.

B. Issue 2 - Watershed Health and Restoration

Watershed restoration is an integral part of a program to aid recovery of fish habitat, riparian habitat, and water quality. One component of a watershed restoration program involves road treatments (such as decommissioning or upgrading), which would reduce sedimentation and erosion and improve water quality.

A second component deals with riparian vegetation. Silvicultural treatments in Riparian Reserves, such as planting unstable areas along streams, thinning densely-stocked young stands, releasing young conifers overtopped by hardwoods, and reforesting shrub and hardwood dominated stands with conifers, would improve bank stabilization, increase shade, and accelerate recruitment of large wood desirable for future in-stream structure. A third watershed restoration component involves the design and placement of in-stream habitat structure in an effort to increase channel complexity and the number of pools. Other restoration opportunities may include mine reclamation or meadow or wetland restoration.

Opportunities may exist to promote the long-term health on lands outside of riparian areas. Management activities would be designed so forests remain productive, resilient, and stable over time to withstand the effects of periodic natural or human-caused stresses such as drought, insect attack, disease, climatic changes, flood, resource management practices, and resource demands.

Key Questions

a. Vegetation Patterns

What processes created the vegetation patterns? See page 38.

Where are the opportunities to maintain or restore stand health or vigor in the upland areas of the WAU? See Map 8 on page 26 and Map 15 on page 47.

What is the current condition of Riparian Reserves in the WAU? See pages 32, 33, 92, and 93, Table 9 on page 34, and Map 11 on page 35.

What and where are the opportunities to restore late-successional conditions in Riparian Reserves? See page 43 and Map 15 on page 47.

b. Soils / Erosion

What are the dominant erosion processes within the WAU? Where have these erosion processes occurred in the past? Where might they occur in the future? See pages 53 through 64, Map 17 on page 54, Map 18 on page 58, and Map 19 on page 61.

Where are the soils that management activities could reduce soil productivity? See pages 53 through 64, Map 17 on page 54, Map 18 on page 58, and Map 19 on page 61.

c. Hydrology / Channel Processes

What are the dominant hydrologic characteristics (e.g. total discharge, and peak, base, and low flows) and other notable hydrologic features and processes in the WAU? See pages 65 through 84.

d. Water Quality

What beneficial uses dependant on aquatic resources occur in the WAU and which water quality parameters are critical to these uses? See pages 80 through 83.

What are the effects of management activities on hydrologic processes? See pages 65 through 84.

Where are the opportunities to improve water quality and hydrologic conditions? See pages 117 and 119 and Appendix G.

e. Fisheries

Where are the historic and current locations of fish populations? See pages 85 through 90 and Map 20 on page 89.

How have fish habitat and populations been affected by hydrologic processes and human activities? See pages 91 through 93

What and where are the restoration opportunities that would benefit the fisheries resource? See pages 119 and 120.

f. Roads

What are the current conditions and distribution of roads in the WAU? See pages 74 through 78.

How are roads impacting other resources within the WAU? See pages 74 through 80, pages 83 and 84, and page 92.

Are there road decommissioning or improvement opportunities in the WAU? Where are the road treatment opportunities? See pages 119 and 120 and Appendix G.

C. Issue 3 - Special Status Species

Key Questions

Special Status Species and Their Habitats

What are the species of concern important in the WAU (e.g. threatened or endangered species, special status species, or species emphasized in other plans)? See pages 94 through 108 and pages 113 through 115.

What is the distribution and character of their habitats? See pages 94 through 115, Map 21 on page 96, Map 22 on page 98, Map 23 on page 104, Map 24 on page 105, and Map 25 on page 107.

III. Human Uses

A. Reference Conditions

The Lower South Umpqua Watershed Analysis Unit has been used by humans for probably thousands of years. Uses of the WAU have included hunting and gathering, subsistence and commercial agriculture, transportation, logging and lumbering, service-related activities, residential dwellings, and recreation.

1. Pre-European Settlement

Little knowledge exists of prehistoric use in the WAU prior to European-American settlement. The indigenous people of the area followed a seasonal way of life hunting deer and elk, and gathering nuts, berries, seeds, and roots.

An Indian village was located along the South Umpqua River in what is now the City of Roseburg. No prehistoric sites have been documented occurring on BLM-administered land. Seven recorded archaeological sites occur on private land on the terraces along the South Umpqua River. The lack of prehistoric evidence in the WAU may be due to the majority of the sites would be located on private land, which have been disturbed by settlement and farming.

2. European-American Exploration and Settlement

The 1800s marked the arrival of fur trappers and settlers into the South Umpqua River Valley. The passage of the Donation Land Claim Act in 1850 opened the region to settlers. Settlers transformed the life and countryside of the area and began the process of shaping it into its current condition. The primary period of settlement in the WAU was between 1850 and 1900. The early settlers established homesites at Melrose, Garden Valley, and the mouth of Deer Creek. A grist mill was constructed in 1851 on Deer Creek, which provided an excellent source of water power. Roseburg, which developed at the mouth of Deer Creek, had a population of 834 people in 1880 (Beckham1986). Several French Canadians associated with the Hudson Bay Company settled in Melrose in the early 1880s.

The early settlers maintained a subsistence lifestyle until markets were established for grain and livestock. These became the main sources of income throughout the 1880s and 1890s. By 1872, a rail line was constructed to Roseburg opening a new avenue of transportation to the north and the possibility of new markets. Two of the earliest sawmills to operate in the area were built at Melrose in 1904 and at Dixonville in 1912 (Beckham 1986).

Early settlers indicated the valleys needed minimal clearing and logs had to be skidded in to build log homes. The early settlers described the valleys as consisting primarily of grass land. Charles Watson remembered when the hills were covered with grass and had only a few scattered trees. This may be due to the indigenous people burning the valley bottoms. Every year, in the fall, the indigenous people would burn the grass and small trees making the fires so light that the big timber was not damaged (Watson 1938).

Charles Criteser told about the days when grass would grow ten to twelve inches high. Burning kept the grazing land in good shape (Charles Oliver Criteser 1938). Some settlers continued the practice of burning the grazing land each year (Nichols 1938, Chapman 1938, and Charles Oliver Criteser 1938). Cadastral survey notes from the mid-nineteenth century indicate the vegetation in the WAU consisted of grasslands on the valley flour, oak openings on the middle of the hill slopes, and timber on the upper hill slopes.

3. Transportation

The Lower South Umpqua Watershed Analysis Unit was a transportation corridor before the earliest explorers. The earliest settlers traveled north along the Applegate Trail through the area to the Willamette Valley. By 1858, a road was constructed from Scottsburg to Deer Creek. The road continued on to the mines at Jacksonville. Beginning in 1861, a stage line connecting Portland and San Francisco began transporting goods and people. As the population of Oregon increased, a state highway was built through the area. The highway was improved to become Interstate 5, which provided efficient transportation from Canada to Mexico.

After World War II, the BLM and private timber companies built roads into their timberlands. Improvements to the transportation system allowed faster transportation of commodities. The State highway system was greatly improved during this time allowing a wider distribution of timber and agricultural products, an increase in the number of travelers, and enabled people to commute to work from greater distances.

B. Current Conditions

The dominant human uses in the Lower South Umpqua Watershed Analysis unit have included agriculture, transportation, timber production, service-related activities, and residential dwellings. Agriculture, residential dwellings, and service-related activities have had the most influence on the WAU. The City of Roseburg is located in the WAU and provides food, gas, and other essentials for tourists, commercial travelers and local residents. Roseburg is the center of commerce for the local area. There are no treaty rights or tribal uses in the WAU, although individual tribal members may utilize the area.

1. Agriculture/Grazing

Agriculture was the basis for early settlement in the WAU but has become less important. Small subsistence farms existed in the area for several years. The broad terraces of the area provided the fertile soils and access to markets necessary for an agricultural economy. The same locales today still sustain agricultural activity but also an increasingly amount of residential development.

Wheat and fruit crops were important agricultural products in the past. They gradually were replaced by the raising of livestock, principally sheep and cattle, and hay as the primary agricultural products. The increase in population has led to the division of farms and homesteads into smaller areas for residential homes.

2. Timber

Timber harvesting has had an influence on the WAU. Both private and BLM-administered land contributed to the timber harvesting over the last 45 years.

One concern that may affect management and timber harvesting on BLM-administered lands is the lack of access to some BLM-administered lands through surrounding properties. Acquisition of easements may be necessary to access some parcels of BLM-administered land in the WAU.

3. Special Forest Products

Another commercial use of forests in the WAU is the collection of Special Forest Products. Cedar boughs, greenery, and firewood were the main Special Forest Products collected in the South River Resource Area in 1999. Special Forest Product sale prices are strongly influenced by product quality, which varies by product and the local area. Salvaging dead and down trees for sawtimber near roads has been the Special Forest Product affecting the WAU the most. Areas where salvaging sawtimber has occurred often contain less large woody debris. Management direction in the RMP provides guidelines for the salvaging of sawtimber.

4. Recreation

Recreation use in the Lower South Umpqua Watershed Analysis Unit is determined by the land ownership, topography, forest types, and age classes in the area. No developed recreation sites occur on BLM-administered land in the WAU at this time. Special Use Permits are not required for recreation use in the WAU.

a. Recreation Opportunity Spectrum (ROS)

The Recreation Opportunity Spectrum (ROS) considers the vast majority of the Federally-administered land in the WAU to be Roaded Natural. The WAU has a strong rural setting. However, the City of Roseburg is located in the WAU. The BLM manages a limited amount of land in the WAU. The areas containing BLM-administered lands are characterized by predominantly natural appearing environments with moderate evidence of the sights and sounds of humans. Resource modification and utilization practices are evident but usually blend with the natural environment. Interaction between users may be low to moderate but with the evidence of other users prevalent. Rustic facilities are provided for user convenience as well as for safety and resource protection. Facilities are designed and constructed to provide for conventional motorized use.

b. Off Highway Vehicles (OHV)

The predominant OHV designation in the RMP for the Lower South Umpqua WAU is 'Limited' to existing roads and trails. Under this designation, existing roads and trails are open to motorized access unless otherwise identified (i.e., hiking trails). Licensed vehicles may use maintained roads and natural surface roads and trails. Registered OHVs such as All Terrain Vehicles (ATVs) and motorcycles not licensed for the public roads may only use existing roads and trails that are not maintained (graveled).

New roads and trails may be approved and constructed in limited areas, through the NEPA process. State funds from gas taxes and registrations may be available to BLM to develop OHV areas. If problems occur within road and trail systems, they may be closed on an emergency basis through 43 CFR 8341 and 8364.

c. Visual Resource Management (VRM)

Visual Resource Management classes are assigned through an inventory system and range from Class I through IV. Class I lands are reserved for their scenic quality and allow for very limited management. Class IV lands allow for major modifications to the existing character of the landscape. These classes are based on the combination of scenic quality, sensitivity level, and distance zones.

The WAU contains VRM Class IV lands. A Class IV designation allows major modifications to the landscape. Management activities may dominate the view and may be the major focus of the viewer's attention. However, every attempt should be made to minimize the impact of activities through careful unit location, minimal disturbance, and repetition of the basic elements of form, line, and texture.

d. Recreation Management

The WAU falls within the South River and Swiftwater Extensive Recreation Management Area (ERMA). Within the ERMA, recreation is mainly unstructured and dispersed, where limited needs or responsibilities require minimal recreation investments. The ERMA, which constitutes the bulk of the public land, gives recreation visitors the freedom of choice with minimal regulatory constraints.

Forms of recreation commonly observed in the Lower South Umpqua WAU include driving for pleasure, hunting, photography, picnicking, camping, shooting or target practice, and gathering (berries, flowers, mushrooms, greens, and rocks). Areas along major roads and the larger streams are common sites for these various forms of recreation.

IV. Vegetation

A. Reference Conditions

The WAU is located in the Klamath and Oregon Coast Range Physiographic Provinces (Franklin and Dyrness 1984). The topography consists of low foothills with wide, flat valleys created by the South Umpqua River. Climax vegetation is characterized by Douglas-fir and conifer-hardwood temperate forest types (Franklin and Dyrness 1984). Vegetative communities reflect the differences between the wetter Coast Range and the drier Klamath Physiographic Provinces.

There is a great diversity of plant communities and landscape patterns in the Lower South Umpqua WAU. The WAU contains a large amount of agricultural and urban lands. Forest vegetation consists of hardwood stands located in the lower foothills adjacent to the interior valleys and conifer stands in the upper foothills along the edges of the WAU. The BLM-administered lands represent about four percent of the WAU. They occur in the upper elevations along the boundaries of the WAU.

General reference information used to characterized vegetation in the Lower South Umpqua WAU is from 1900, 1914, and 1936 vegetation data. The 1900 and 1914 vegetation data was not mapped at the same resolution as the 1936 information. The 1900, 1914, and 1936 data indicate most of the WAU was considered to be in non-commercial forest types (see Maps 4, 5, and 6 and Tables 3, 4, 5 and 6).

Map 4. Lower South Umpqua Watershed Analysis Unit 1900 Vegetation Classifications

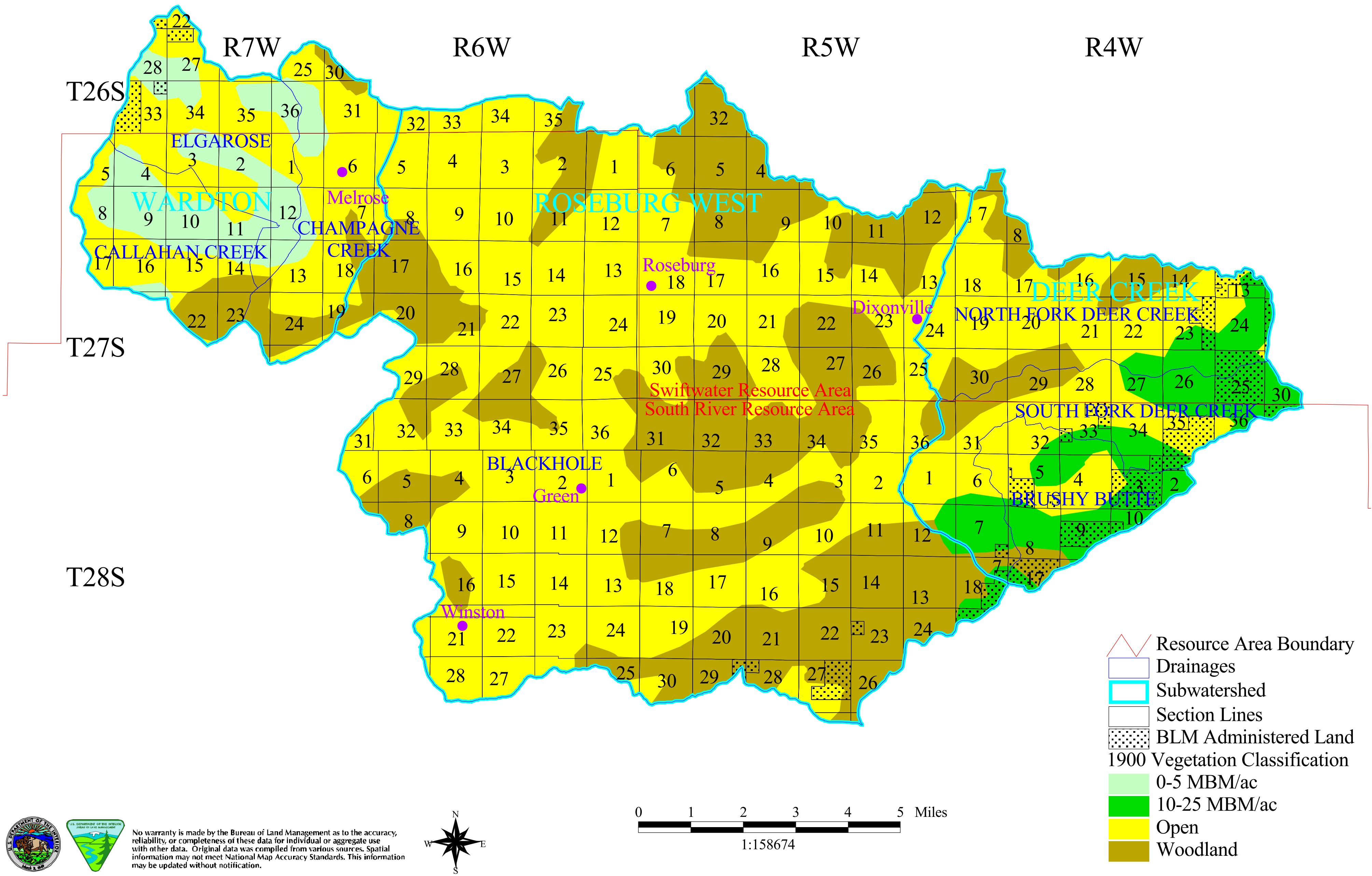


Table 3. 1900 Vegetation Data.

	Open (Nonforested)		Woodland (Hardwoods, Brush)		0 to 5 MBM per Acre (Early to Mid Seral)		10 to 25 MBM per Acre (Merchantable Timber, Mid to Late Seral)		
Area	Acres	%	Acres	%	Acres	%	Acres	%	Total Acres
Brushy Butte	1,767	39	319	7	0	0	2,425	54	4,511
North Fork Deer Creek	6,175	62	2,236	23	0	0	1,473	15	9,884
South Fork Deer Creek	3,480	46	952	13	0	0	3,136	41	7,568
Deer Creek Subwatershed	11,422	52	3,507	16	0	0	7,034	32	21,963
Blackhole	42,179	59	28,470	40	0	0	324	0	70,973
Roseburg West Subwatershed	42,179	59	28,470	40	0	0	324	0	70,973
Callahan Creek	2,303	43	837	15	2,275	42	0	0	5,415
Champagne Creek	4,219	70	1,171	19	662	11	0	0	6,052
Elgarose	3,564	59	30	0	2,422	40	0	0	6,016
Wardton Subwatershed	10,086	58	2,038	12	5,359	31	0	0	17,483
Lower South Umpqua WAU	63,687	58	34,015	31	5,359	5	7,358	7	110,419

Map 5. Lower South Umpqua Watershed Analysis Unit
1914 Vegetation Classifications

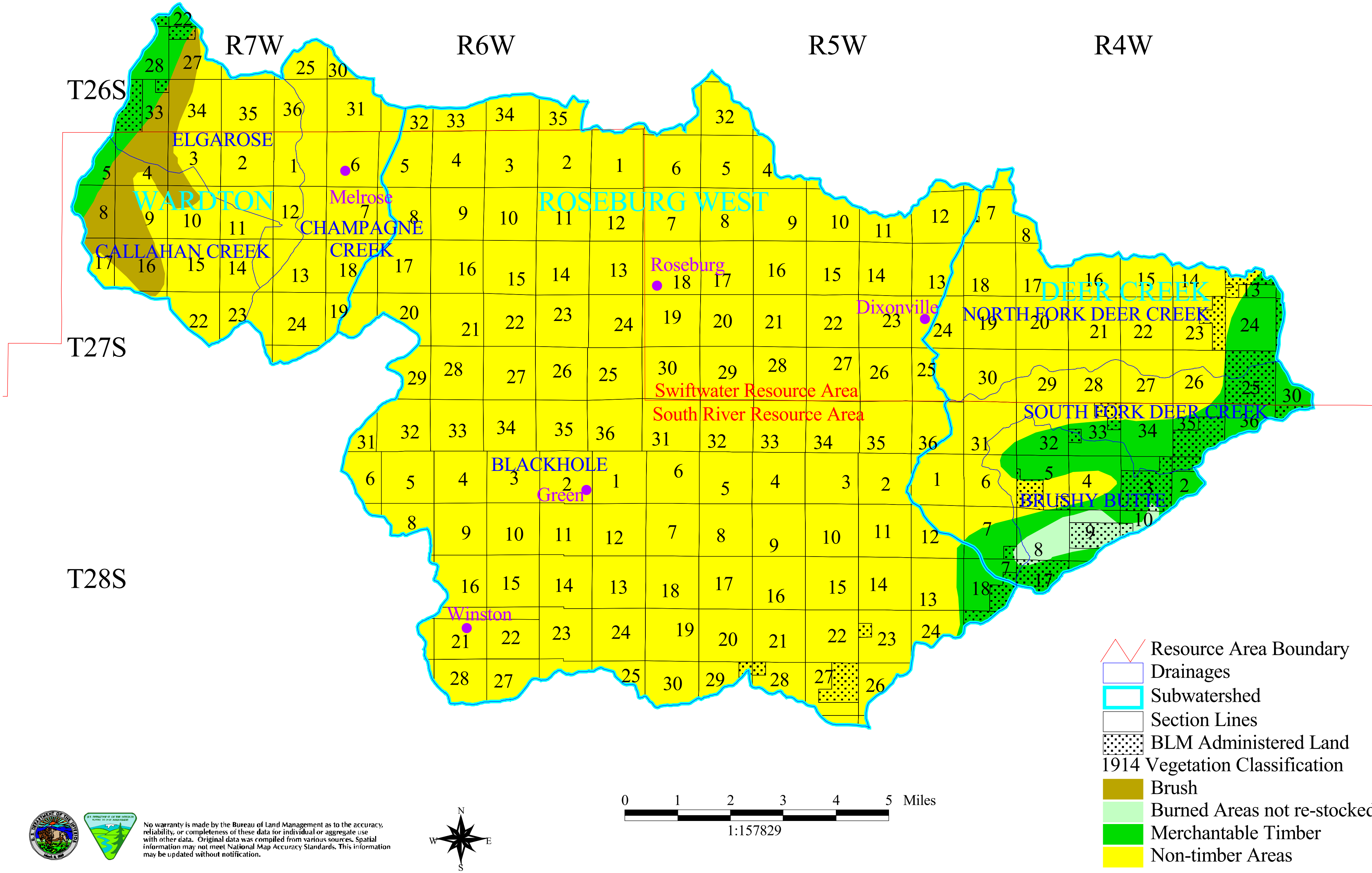


Table 4. 1914 Vegetation Data.

	Non-timber		Brush		Burned, not restocked		Merchantable timber		
Area	Acres	%	Acres	%	Acres	%	Acres	%	Total Acres
Brushy Butte	1,054	23	0	0	832	18	2,625	58	4,511
North Fork Deer Creek	8,894	90	0	0	0	0	989	10	9,883
South Fork Deer Creek	4,647	61	0	0	55	1	2,867	38	7,569
Deer Creek Subwatershed	14,595	66	0	0	887	4	6,481	30	21,963
Blackhole	70,273	99	0	0	0	0	700	1	70,973
Roseburg West Subwatershed	70,273	99	0	0	0	0	700	1	70,973
Callahan Creek	3,287	61	1,784	33	0	0	344	6	5,415
Champagne Creek	6,052	100	0	0	0	0	0	0	6,052
Elgarose	4,021	67	919	15	0	0	1,076	18	6,016
Wardton Subwatershed	13,360	76	2,703	15	0	0	1,420	8	17,483
Lower South Umpqua WAU	98,228	89	2,703	2	887	1	8,601	8	110,419

Map 6. Lower South Umpqua Watershed Analysis Unit
1936 Age Class Distribution

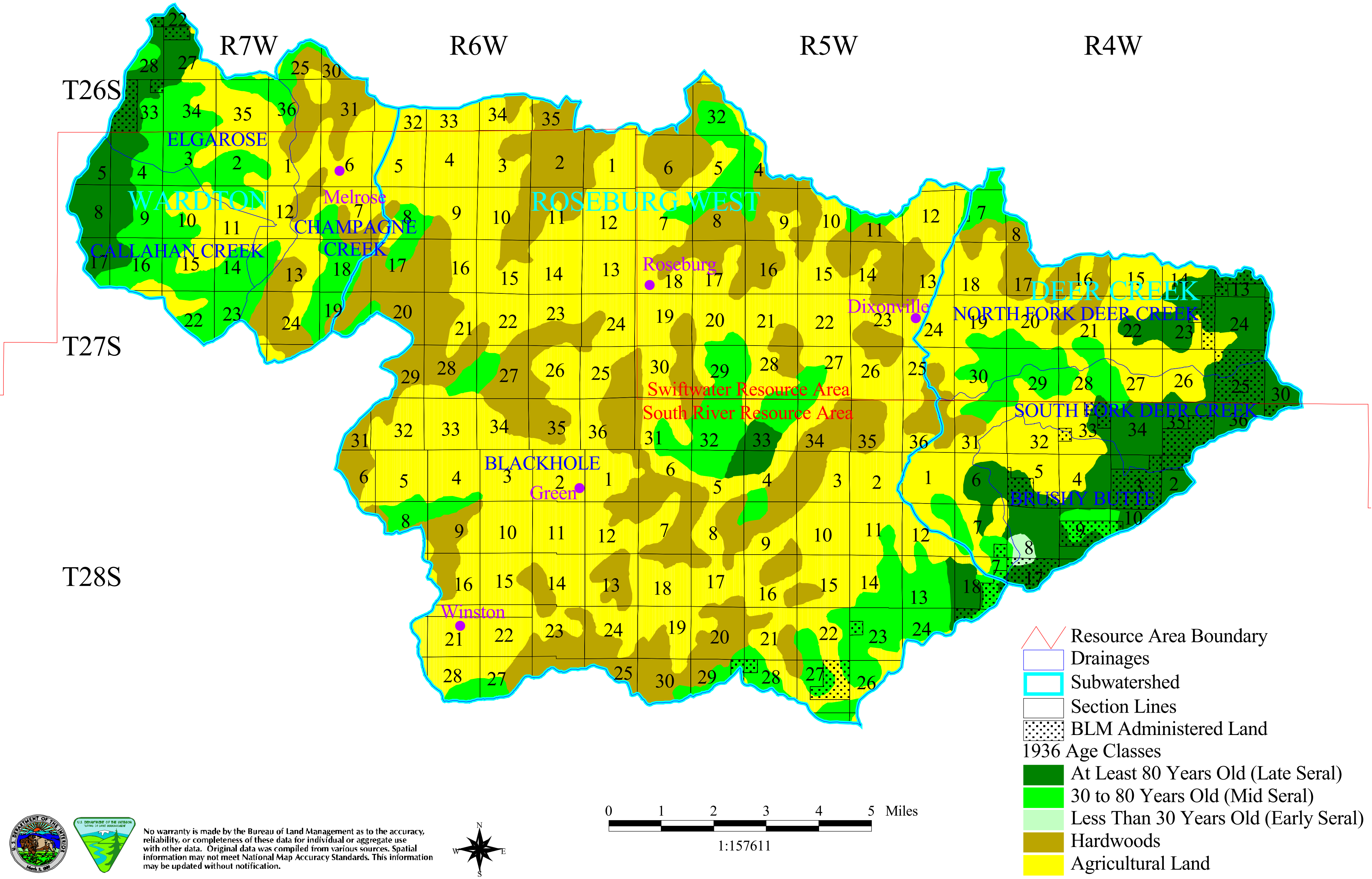


Table 5. 1936 Age Class Distribution in the Lower South Umpqua WAU.

	Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (30 to 80 Years Old)		Late Seral (At Least 80 Years Old)		Hardwoods		
Area	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Total Acres
Brushy Butte	1,488	33	120	3	334	7	2,568	57	0	0	4,510
North Fork Deer Creek	4,932	50	0	0	1,349	14	2,064	21	1,539	16	9,884
South Fork Deer Creek	2,843	38	25	0	1,417	19	3,000	40	284	4	7,569
Deer Creek Subwatershed	9,263	42	145	1	3,100	14	7,632	35	1,823	8	21,963
Blackhole	39,919	56	0	0	8,507	12	870	1	21,678	31	70,974
Roseburg West Subwatershed	39,919	56	0	0	8,507	12	870	1	21,678	31	70,974
Callahan Creek	1,359	25	0	0	2,600	48	1,456	27	0	0	5,415
Champagne Creek	2,466	41	0	0	1,150	19	0	0	2,436	40	6,052
Elgarose	2,180	36	0	0	2,424	40	1,279	21	134	2	6,017
Wardton Subwatershed	6,005	34	0	0	6,174	35	2,735	16	2,570	15	17,484
Lower South Umpqua WAU	55,187	50	145	0	17,781	16	11,237	10	26,071	24	110,421

Table 6. Comparison of 1900, 1914, and 1936 Vegetation Type Percentages in the Lower South Umpqua WAU.

Vegetation Type	1900	1914	1936
Open, Non-timber, Brush	88	91	74
Burned, Early Seral	5	1	0
Merchantable Timber	7	8	26

1. Fire History and Natural Fire Regimes

Fire has been an important disturbance factor in Pacific Northwest forests for thousands of years. The "unmanaged" or "natural" forests, those that developed before widespread logging or fire protection existed, were initiated by fire and most have been altered by fire since establishment. Early accounts suggest that fires were highly variable, occurring frequently or infrequently and killed all of the trees at times or left the mature trees unscathed (Agee 1990).

Fire regimes of the Pacific Northwest have been described by Agee (1981). Fire regimes are broad, artificially grouped categories, which overlap considerably with one another. Forests are considered to have a similar fire regime when fires occur with similar frequency, severity, and extent. Effects of forest fires can be more precisely described if forest types can be grouped by fire regimes. The Lower South Umpqua Watershed Analysis Unit is considered to have a high-severity fire regime. High-severity fire regimes typically occur in cool, moist forest types. In high-severity fire regimes, fires are infrequent (generally more than 100 years between fires) and occur under unusual conditions, such as during droughts, during east wind weather events (hot and dry foehn winds), and with an ignition source such as lightning. Fires are often of short duration (lasting from days to weeks) but of high intensity and severity (Pickford et al. 1980). Most of the lands on the Roseburg BLM District are classified as being in a high-severity fire regime. High-severity fire regimes are common in the Oregon coastal mountains, the middle to northern Cascade Mountains, the Olympic Mountains, and other typical forests west of the Cascade Mountains.

Other fire regimes exist within the Lower South Umpqua WAU. Lower elevations have more open, grass covered forest types which transition to western hemlock/Douglas-fir forests. The transition occurs with changes in aspect and elevation.

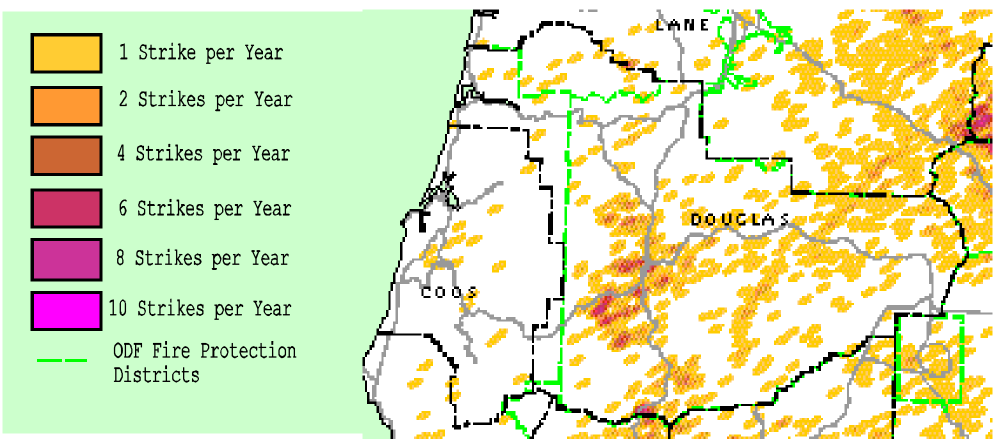
Accurate fire return intervals have not been calculated in Pacific Northwest forests because the intervals between fires are long and may not be cyclic (Agee and Flewelling 1983). On drier sites, such forests may burn every 100 to 200 years. Fahnestock and Agee (1983) estimated the regional average to be 230 years. Douglas-fir begins to be replaced by the more shade tolerant western hemlock at approximately 250 years of age and continues until the stand is about 700 to 1,000 years old when western hemlock dominates the stand. The cycle from Douglas-fir to western hemlock is rarely completed because fires, which create stand openings allowing Douglas-fir to regenerate, usually occur before the Douglas-fir disappears from the stand (Agee 1981).

Fire suppression during the past 75 years has been successful at minimizing the number of acres burned by wildfires. During this same period, prescribed fire has been used extensively. The pattern of prescribed fire use has evolved in the last 50 years. Originally, prescribed fire was used almost exclusively for reducing fire hazards. More recently the emphasis has shifted to using prescribed fire for site preparation prior to reforestation (Norris 1990).

2. Recent Fire History

Lightning is the primary natural source of forest fires in the world. The Pacific Northwest has relatively mild thunderstorm activity compared to the southeastern United States. Although, the average annual number of lightning caused fires is greater in the West because less precipitation accompanies the thunderstorms (Agee 1993). Considerable variation in thunderstorm tracking patterns exists from year to year and from storm to storm. Some thunderstorms are widespread and others consist of localized events (Morris 1934). The lightning strike frequency map (see Map 7) shows less than one lightning strike per year occurred over most of the Roseburg BLM District between 1992 and 1996. This map graphically displays the widespread and random distribution of lightning across Douglas County but gives no indication which lightning strikes may have ignited wildfires.

Map 7. Number of Lightning Strikes in Douglas County from 1992 to 1996.



Nineteen eighty-seven was the most severe fire year in the last 50 years and one of the two worst in the last 120 years. However, only 30 percent of the average number of acres historically burned by wildfire in Oregon were burned in 1987. Modern fire suppression and fire management strategies have had a profound effect on natural fire frequency, intensity, species composition, vegetation density, and forest structure in many Pacific Northwest forests (Norris 1990). From 1980 to 1995, ten fires burned approximately 84 acres in the Lower South Umpqua WAU. Most of the fires were caused by lightning, burning approximately eight acres. The two human caused fires burned approximately 76 acres.

The combined effects of fire suppression, timber harvesting followed by prescribed burning, and occasional wildfires have helped shaped vegetative conditions the Lower South Umpqua WAU. Discussing these forests in terms of the natural fire regime helps explain why species composition and forest density has changed with human management dating back thousands of years when native Indians set fires as a means of improving areas for foraging. In many forests of the West, years of successful fire suppression have created unnatural fuel accumulations causing fires to be more destructive, burning with greater intensity and in fire regimes where stand replacement fires would rarely occur in a "natural" forest. Forest health has declined in many areas because fire has been excluded. Fire suppression has probably had little or no effect on fuel accumulation in the forests west of the Cascade Mountains, where the natural fire regime has a long return interval (with the exception of southwest Oregon where the fire return interval is shorter) (Norris 1990).

B. Current Vegetation Conditions

Various seral stages, plant communities, and landscape patterns occur in the Lower South Umpqua WAU. For this watershed analysis, 1999 vegetation conditions on BLM-administered land is described by the age of the dominant conifer cover for each stand (see Table 7 and Map 8). Agricultural uses and hardwood stands make up a large portion of the private lands in the WAU. In the forested areas, structural classes range from establishment (early seral) to late seral (see Table 8 and Map 9).

1. Vegetative Characterization

Vegetation zones in the Lower South Umpqua Watershed Analysis Unit were characterized from the Natural Resources Conservation Service Soil Survey report by Gene Hickman (Hickman 1994). Vegetation zones may cover large geographical areas but always have a single set of potential native plant communities repeated throughout the zone. The patterns are predictable since they are related to local landscape features such as aspect, soil, and landform. Microclimate would be relatively similar throughout a given zone. Vegetation zones give an approximate guide to complex local vegetation patterns, natural plant succession, and stand development processes. A wide variety of soils and related geologic features directly affect local plant distribution and the resulting plant communities.

Four vegetative zones occur in the Lower South Umpqua WAU (see Map 10). The Grand Fir Zone makes up most of the BLM-administered lands in the WAU. The Western Hemlock Zone makes up a small amount of the BLM-administered land in the WAU at higher elevations along the southeastern boundary. A small amount of the BLM-administered lands are included in the Interior Valleys and Foothills Zone. The Cool Hemlock Zone occurs along the western edge of the WAU but does not occur on BLM-administered land.

a. Grand Fir Zone

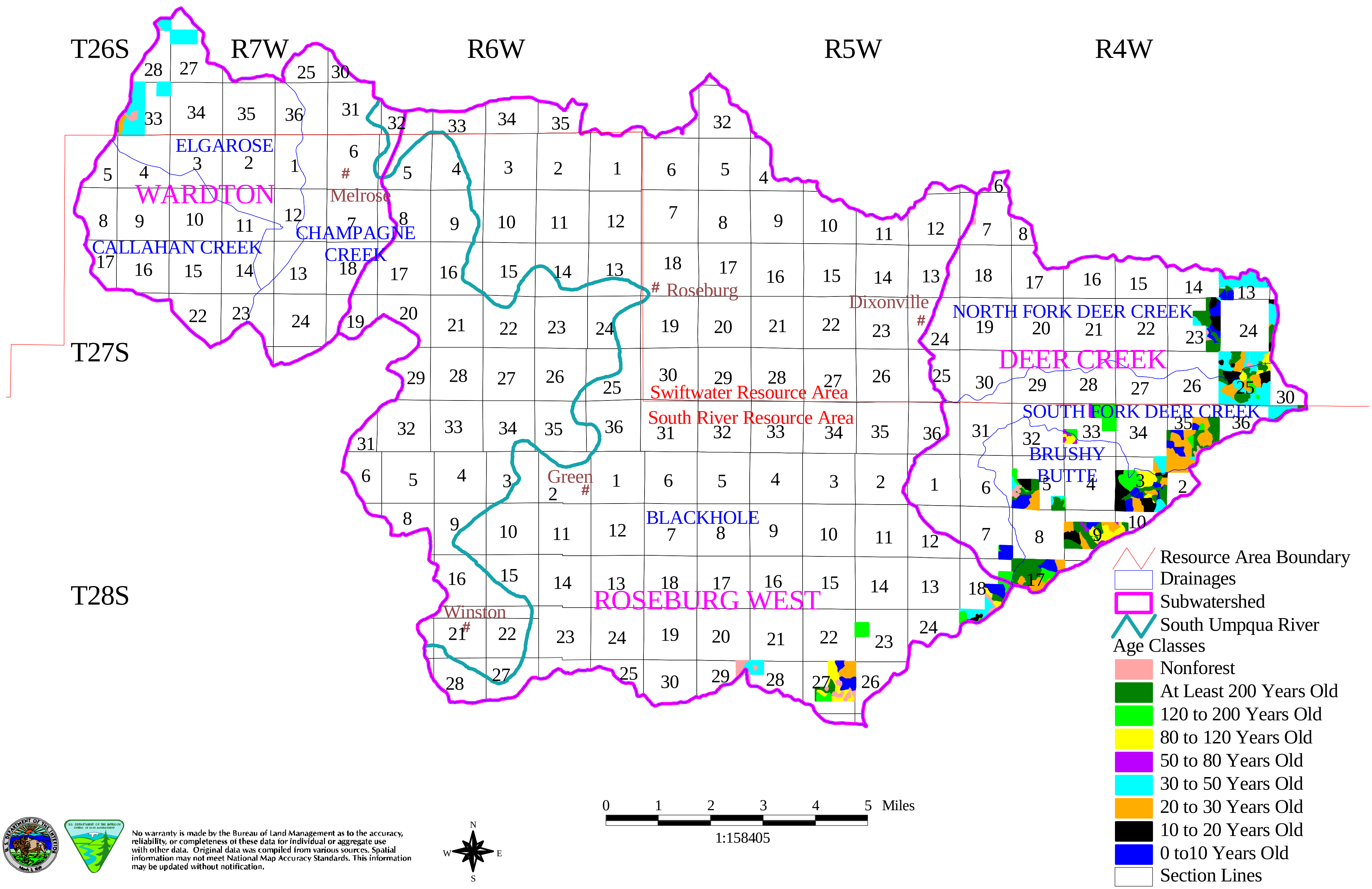
The Grand Fir Zone forms a transition between moist hemlock forests and the drier central valleys. This zone makes up most of the BLM managed lands in the Lower South Umpqua WAU. This area of mountains and foothills receives from 40 to 55 inches average annual precipitation. Elevation remains below about 1,500 feet.

Douglas-fir dominates the older stands, with grand fir being common on the northern slopes and minor or absent on the south slopes. Golden chinkapin occurs regularly on north aspects, with Pacific madrone and occasionally California black oak occurring on south aspects. Incense cedar is often present. The area is generally too dry for western hemlock except in some drainages or on very moist north slopes.

Table 7. 1999 BLM Age Class Distribution.

	Number of Acres by Age Class and Percent of Total																	
Area	Nonforest	%	0 to 10	%	10 to 20	%	20 to 30	%	30 to 50	%	50 to 80	%	80 to 120	%	120 to 200	%	200 +	%	Total
Brushy Butte	10	1	143	11	172	13	234	18	33	3	32	2	165	13	148	11	369	28	1,306
North Fork Deer Creek	12	2	65	10	85	13	35	5	284	43	0	0	12	2	0	0	160	25	653
South Fork Deer Creek	8	1	91	8	41	3	321	27	262	22	14	1	37	3	203	17	199	17	1,176
Deer Creek Subwatershed	30	1	299	10	298	10	590	19	579	18	46	1	214	7	351	11	728	23	3,135
Blackhole	84	14	94	15	12	2	51	8	106	17	0	0	121	20	102	17	48	8	618
Roseburg West Subwatershed	84	14	94	15	12	2	51	8	106	17	0	0	121	20	102	17	48	8	618
Callahan Creek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Champagne Creek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elgarose	26	6	0	0	0	0	26	6	338	84	0	0	0	0	0	0	12	3	402
Wardton Subwatershed	26	6	0	0	0	0	26	6	338	84	0	0	0	0	0	0	12	3	402
Lower South Umpqua WAU	140	3	393	9	310	7	667	16	1,023	25	46	1	335	8	453	11	788	19	4,155

Map 8. Lower South Umpqua Watershed Analysis Unit
1999 BLM Age Class Distribution

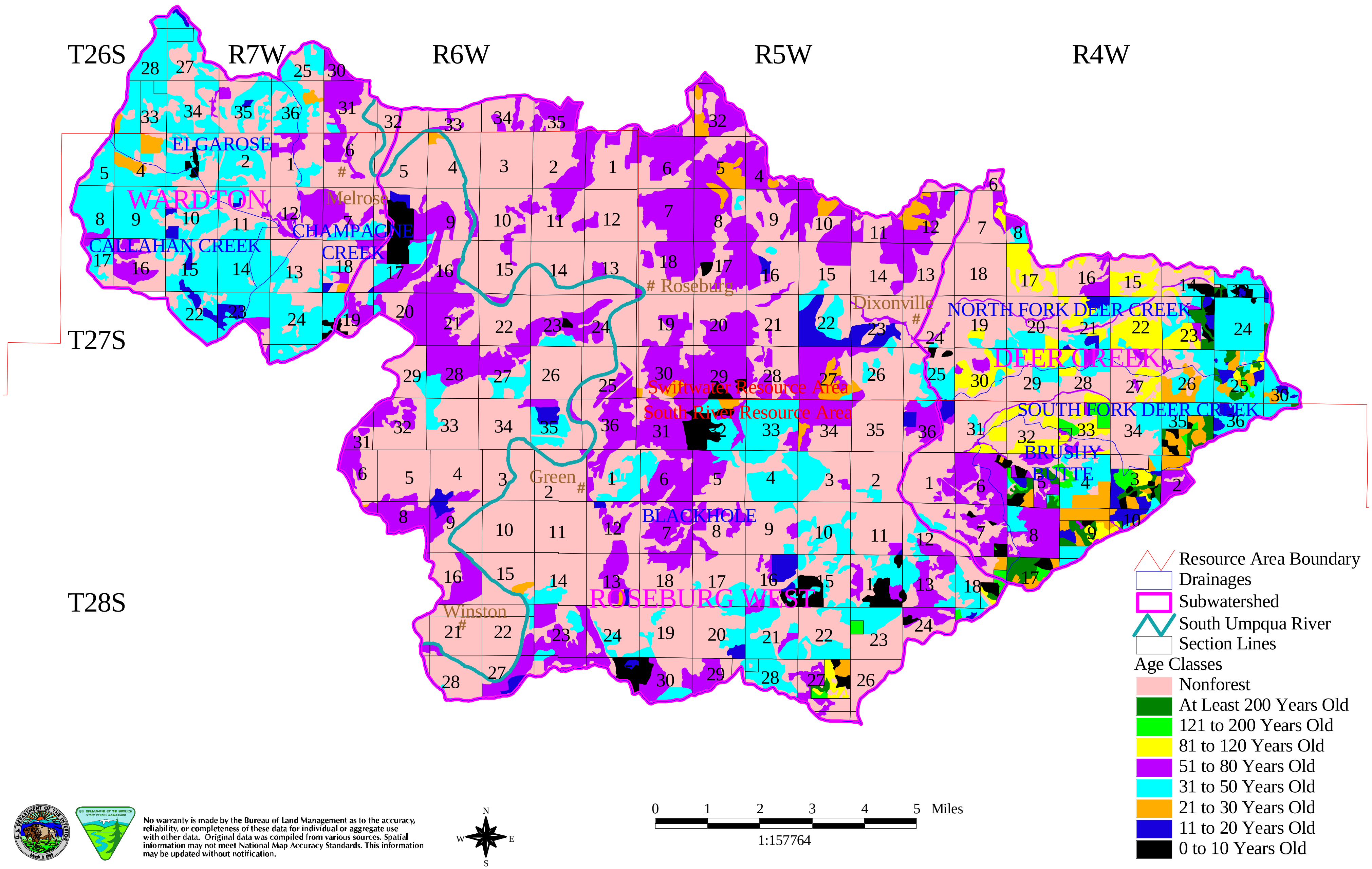


No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data was compiled from various sources. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

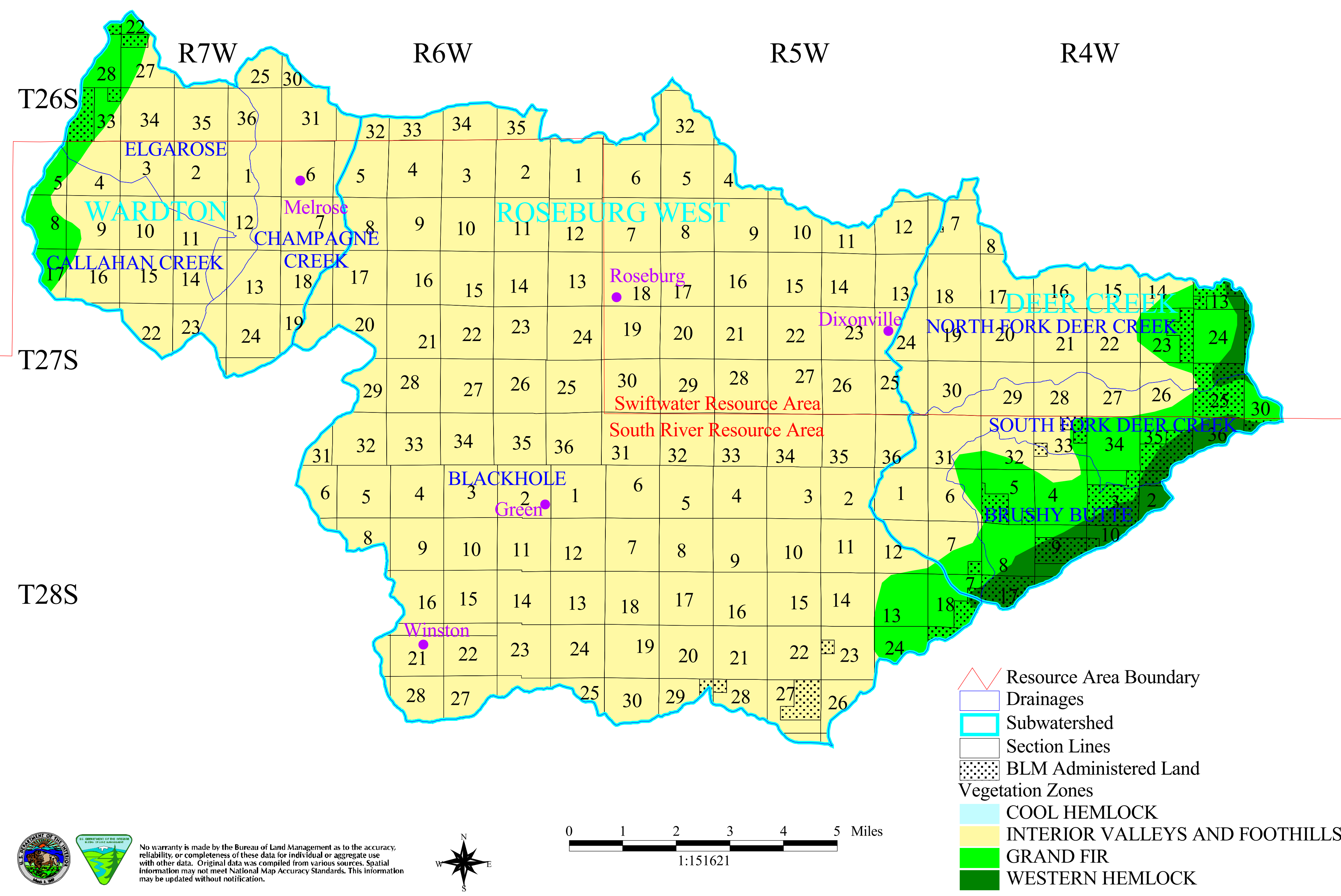
Table 8. 1999 Age Class Distribution.

Area	Number of Acres by Age Class and Percent of Total																				
	Nonforest		0 to 10		10 to 20		20 to 30		30 to 50		50 to 80		80 to 120		120 to 200		200 +		Hardwoods		Total
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Brushy Butte	800	18	193	4	267	6	569	13	1,466	32	288	6	266	6	206	5	412	9	44	1	4,511
North Fork Deer Creek	4,711	48	189	2	167	2	59	1	2,091	21	1,808	18	12	0	0	0	160	2	685	7	9,882
South Fork Deer Creek	3,491	46	148	2	317	4	426	6	2,004	26	426	6	117	2	243	3	199	3	196	3	7,567
Deer Creek Subwatershed	9,002	41	530	2	751	3	1,054	5	5,561	25	2,522	11	395	2	449	2	771	4	925	4	21,960
Blackhole	42,463	60	1,398	2	322	0	1,011	1	1,337	2	943	1	121	0	102	0	48	0	23,228	33	70,973
Roseburg West Subwatershed	42,463	60	1,398	2	322	0	1,011	1	1,337	2	943	1	121	0	102	0	48	0	23,228	33	70,973
Callahan Creek	1,357	25	10	0	91	2	0	0	3,000	56	0	0	0	0	0	0	0	0	919	17	5,377
Champagne Creek	3,046	50	72	1	23	0	0	0	1,442	24	21	0	0	0	0	0	0	0	1,449	24	6,053
Elgarose	2,553	45	61	1	20	0	26	0	2,436	43	0	0	0	0	0	0	12	0	909	16	5,615
Wardton Subwatershed	6,956	40	143	1	134	1	26	0	6,878	39	21	0	0	0	0	0	12	0	3,277	19	17,447
Lower South Umpqua WAU	58,421	53	2,071	2	1,207	1	2,091	2	13,776	12	3,486	3	516	0	551	0	831	1	27,430	25	110,380

Map 9. Lower South Umpqua Watershed Analysis Unit
1999 Age Class Distribution



Map 10. Lower South Umpqua Watershed Analysis Unit
Vegetation Zones



Understory shrubs on north slopes include salal, cascade Oregon grape, western hazel, creambush oceanspray, red huckleberry, western prince's pine, whipplevine, yerba buena and hairy honeysuckle. South slopes support any of the above, although red huckleberry, cascade Oregon grape, and salal, which require more moisture, have minor species occurrence. Grasses and poison oak also become more abundant on south slopes. Where the drier edge of the zone approaches the Interior Valleys and Foothills Zone, salal, red huckleberry, and even grand fir may drop out. Some key indicator species for the zone, such as Oregon grape, golden chinkapin, wild ginger, and inside-out-flower, remain present.

The Grand Fir Zone in the Lower South Umpqua WAU and surrounding areas represents a transition area between the northern portion, which is more like the forests of the southern Willamette Valley foothills, and the southern portion, which is more like the Klamath Mountain geologic province. Geological differences and climatic changes result in more species diversity and the increasing importance of California black oak, sugar pine, ponderosa pine, canyon live oak, incense cedar, and grasses south of the WAU.

b. Western Hemlock Zone

This zone occupies a small amount of land in the Lower South Umpqua WAU, mostly along the ridges in the southeastern portion of the WAU. Douglas-fir is the dominant species. Western hemlock is a significant understory or dominant overstory species in older stands on north aspects. It may be present in minor amounts on south aspects. Grand fir, western redcedar, and chinkapin may also occur. Red alder and bigleaf maple occur in favorable locations. Understory species include western sword fern, oxalis, vine maple, currant, western hazel, creambush oceanspray, Pacific rhododendron, salal, red huckleberry, cascade Oregon grape, and evergreen huckleberry.

c. Interior Valleys and Foothills Zone

The Interior Valleys and Foothill Zone occurs in the central portion of the WAU. Much of the zone is composed of hills and low mountains extending into the interior from both the Cascade and Coast Range Mountains. The average annual precipitation ranges from about 30 to 50 inches.

This zone is separated ecologically from the adjacent vegetative zones by its dry, warm climate, the high proportion of hardwoods in the uplands, and the absence of indicator species from the Grand Fir Zone. Much of the natural vegetation of this zone has been affected by settlement or grazing.

Uplands with the most favorable soils have coniferous forests of Douglas-fir and subordinate species, such as madrone, maple, or oaks. More droughty soils in the uplands support hardwood dominated stands of madrone, Oregon white oak, some California black oak, and minor amounts of conifers. Some shallow slopes support only scattered Oregon white oak and grass or shrubs such as wedgeleaf ceanothus and poison oak.

Understories on bottom lands vary with soil conditions but usually contain common snowberry and Pacific poison oak. Some areas are naturally treeless meadows.

2. Insects and Diseases

Insects and diseases are capable of causing both large and small-scale disturbances across the landscape. However, the risk of large scale habitat loss due to insects and diseases over the WAU is minor. Native insect and diseases may cause mortality of a single tree or small patch of trees (less than one acre). The magnitude of insect and disease-related disturbance is greatly influenced by species composition, age class, stand structure, and history of other disturbances on the same site.

a. Insects

Insect activity within stands in the WAU is present at endemic levels. Insect attacks and out breaks are almost always associated with conditions that stress the tree. There is a common association between root diseases and bark beetles. A high proportion of laminated root rot infected trees are actually killed by bark beetles and not by the fungus. Laminated root rot plays a significant role in maintaining endemic bark beetle populations over time. Beetle populations are most likely to increase and attack live trees the year after when a minimum of three Douglas-fir trees per acre, which are at least ten inches in diameter at breast height (DBH) are blown down (Goheen 1996).

Mountain pine beetle and western pine beetle also attack trees that are stressed by drought or root disease. However, infestations are more strongly correlated with low host vigor resulting from overstocking. The major hosts of the mountain pine beetle are ponderosa and sugar pines. Western pine beetle infests ponderosa pine.

When epidemic insect populations are reached, healthy trees may be attacked and killed. Direct control measures are impractical and generally not recommended. Damage can be reduced indirectly by thinning. Keeping trees in a healthy, vigorous condition is the most practical means of reducing the impact from bark beetles (Filip and Schmitt 1990).

b. Diseases

(1) Root Diseases

Root diseases are present at endemic levels in the WAU and are not considered to be a concern. Laminated root rot (Phellinus weirii), annosus root disease (Heterobasidion annosum), armillaria root disease (Armillaria ostoyae), and black stain root disease (Leptographium wageneri) are common root diseases that may be present in the WAU. Root diseases can cause scattered mortality of individual trees or openings devoid of susceptible mature trees.

Root pathogens are extremely difficult to eradicate from the site once they become established. but. Depending on the disease, the damage can be minimized by increasing host vigor, favoring disease-tolerant conifer species, or reducing inoculum. Root diseases would be managed on a site specific basis.

(2) Non-Native Diseases

Non-native diseases are considered to be a minor concern in the WAU. White pine blister rust, caused by the fungus Cronartium ribicola, can infect sugar or western white pines. Western white pine does not occur in the WAU. Sugar pine occurs on BLM-administered lands only where rust resistant seedlings were planted.

Port-Orford cedar root disease (Phytophthora lateralis) is an introduced disease, which infects Port-Orford cedar. The Lower South Umpqua WAU is considered to be outside the natural range of Port-Orford cedar. Port-Orford cedar does not occur on BLM-administered lands in the WAU. It only occurs as an ornamental planted in residential areas of the WAU.

3. Riparian Vegetation

Riparian Reserves within the Lower South Umpqua WAU account for approximately 1,026 acres (25 percent) of the BLM-administered land (see Table 9 and Map 11). The purpose of Riparian Reserves is to maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide greater connectivity of the watershed (USDA and USDI 1994b). Silvicultural treatments applied within Riparian Reserves would be to control stocking or reestablish, establish, or maintain desired vegetation characteristics to attain Aquatic Conservation Strategy objectives.

Riparian Reserve widths were developed using the Regional Ecosystem Office approved methodology in determining site tree heights for Riparian Reserves. This methodology uses average site index computed from inventory plots throughout the fifth field watershed (Lower South Umpqua Watershed), which corresponds with this WAU. For this watershed analysis, Riparian Reserve widths use a site potential tree height of 160. All intermittent streams, which are considered to be non-fish bearing streams for this watershed analysis, were analyzed using a Riparian Reserve width of 160 feet on each side of the stream. Perennial streams, which are considered to be fish bearing streams for this watershed analysis, were analyzed using a Riparian Reserve width of 320 feet (two times the site potential tree height) on each side of the stream. Actual projects would use site specific information, such as if a stream was fish bearing, to determine if a stream needed a Riparian Reserve width of 160 or 320 feet.

Riparian Reserve widths may be adjusted following watershed analysis, a site specific analysis, and describing the rationale for the adjustment through the appropriate NEPA decision making process (USDI 1995). Critical hillslope, riparian, channel processes and features, and the contribution of Riparian

Reserves to benefit aquatic and terrestrial species would be the basis for the analysis. As a minimum, a fisheries biologist, soil scientist, hydrologist, botanist, and wildlife biologist would be expected to conduct the analysis for adjusting Riparian Reserve widths. The Riparian Reserve Module could be used to adjust Riparian Reserve widths.

4. Private Lands

Private lands account for approximately 96 percent (106,225 acres) of the Lower South Umpqua WAU (see Table 10 and Map 12). Private ownership in the valleys consists mainly of agricultural and urban (residential) lands. Approximately 19 percent of the private lands are considered to be conifer forests.

Although private lands are the major component of the WAU, the focus of this watershed analysis is on BLM-administered lands. Private forest lands are in a constant state of change and would continue to be harvested when growth and economic factors provide a satisfactory return to the landowner. The BLM cannot predict the timing or amount of harvesting which may occur on private lands in this WAU.

Table 9. 1999 Riparian Reserve Age Class Distribution.

	Number of Acres by Age Class and Percent of Total																		
Area	Nonforest	%	0 to 10	%	10 to 20	%	20 to 30	%	30 to 50	%	50 to 80	%	80 to 120	%	120 to 200	%	200 +	%	Total
Brushy Butte	3	1	50	14	43	12	70	20	11	3	1	0	9	3	22	6	140	40	349
North Fork Deer Creek	1	1	21	11	26	13	3	2	76	39	0	0	0	0	0	0	67	35	194
South Fork Deer Creek	0	0	18	6	18	6	76	24	123	39	0	0	6	2	36	12	36	12	313
Deer Creek Subwatershed	4	0	89	10	87	10	149	17	210	25	1	0	15	2	58	7	243	28	856
Blackhole	0	0	17	25	0	0	14	21	4	6	0	0	16	24	9	13	7	10	67
Roseburg West Subwatershed	0	0	17	25	0	0	14	21	4	6	0	0	16	24	9	13	7	10	67
Callahan Creek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Champagne Creek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elgarose	13	13	0	0	0	0	0	0	90	87	0	0	0	0	0	0	0	0	103
Wardton Subwatershed	13	13	0	0	0	0	0	0	90	87	0	0	0	0	0	0	0	0	103
Lower South Umpqua WAU	17	2	106	10	87	8	163	16	304	30	1	0	31	3	67	7	250	24	1,026

Map 11. Lower South Umpqua Watershed Analysis Unit
Riparian Reserve Age Class Distribution

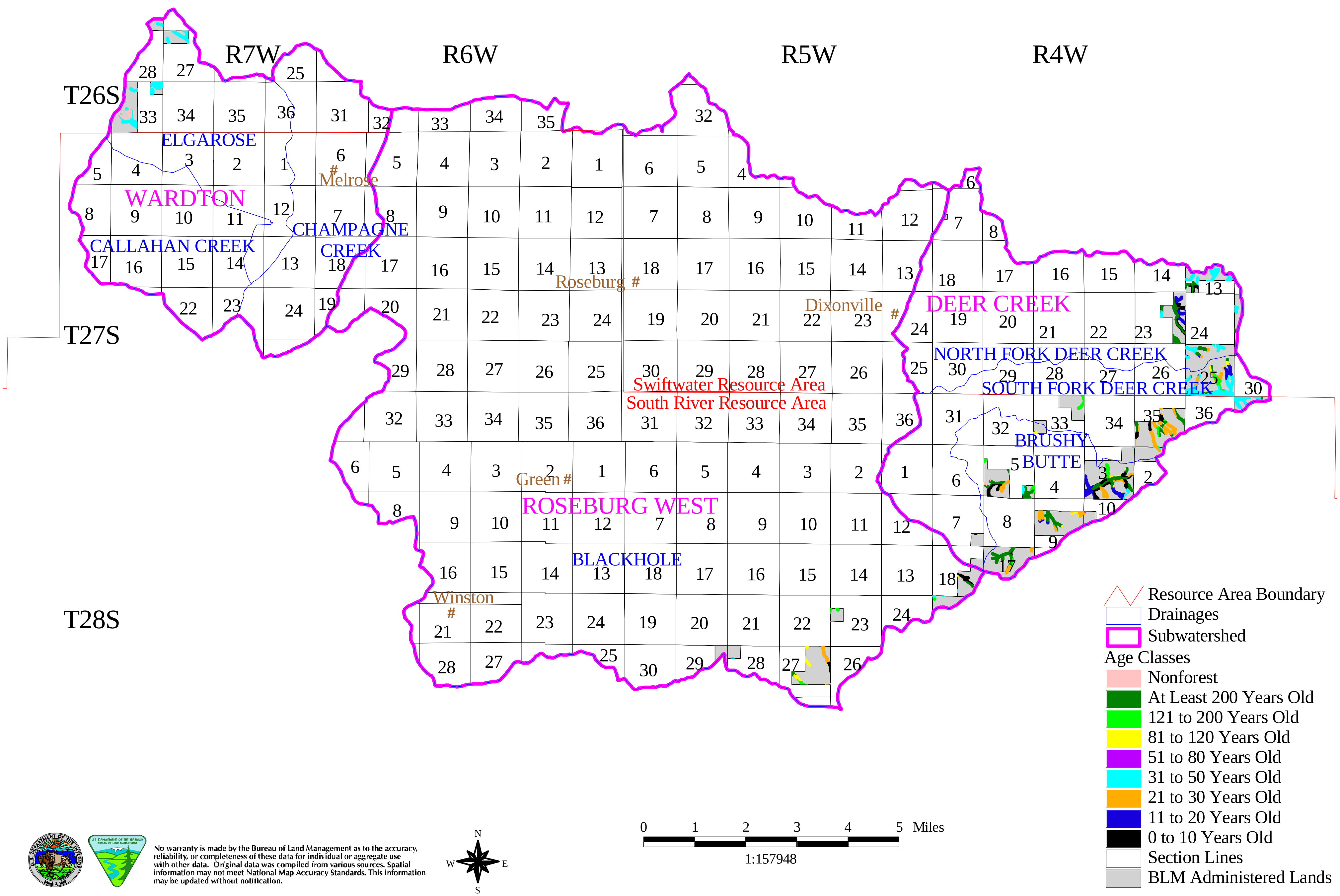
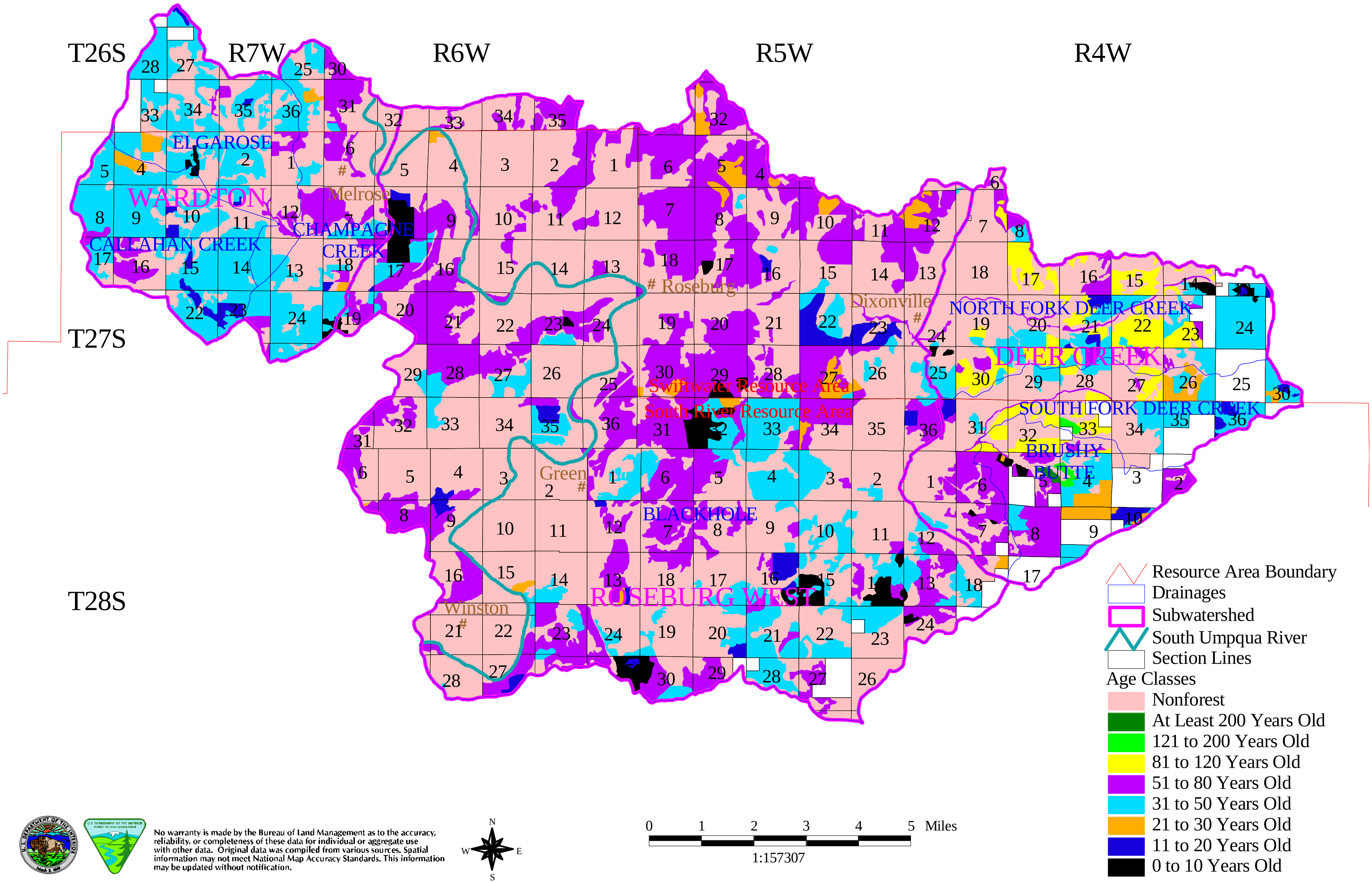


Table 10. 1999 Private Age Class Distribution.

Area	Number of Acres by Age Class and Percent of Total																				
	Nonforest		0 to 10		10 to 20		20 to 30		30 to 50		50 to 80		80 to 120		120 to 200		200 +		Hardwoods		Total
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Brushy Butte	790	25	50	2	95	3	335	10	1,433	45	256	8	101	3	58	2	43	1	44	1	3,205
North Fork Deer Creek	4,699	51	124	1	82	1	24	0	1,807	20	1,808	20	0	0	0	0	0	0	685	7	9,229
South Fork Deer Creek	3,483	54	57	1	276	4	105	2	1,742	27	412	6	80	1	40	1	0	0	196	3	6,391
Deer Creek Subwatershed	8,972	48	231	1	453	2	464	2	4,982	26	2,476	13	181	1	98	1	43	0	925	5	18,825
Blackhole	42,379	60	1,304	2	310	0	960	1	1,231	2	943	1	0	0	0	0	0	0	23,228	33	70,355
Roseburg West Subwatershed	42,379	60	1,304	2	310	0	960	1	1,231	2	943	1	0	0	0	0	0	0	23,228	33	70,355
Callahan Creek	1,357	25	10	0	91	2	0	0	3,000	56	0	0	0	0	0	0	0	0	919	17	5,377
Champagne Creek	3,046	50	72	1	23	0	0	0	1,442	24	21	0	0	0	0	0	0	0	1,449	24	6,053
Elgarose	2,527	45	61	1	20	0	0	0	2,098	37	0	0	0	0	0	0	0	0	909	16	5,615
Wardton Subwatershed	6,930	41	143	1	134	1	0	0	6,540	38	21	0	0	0	0	0	0	0	3,277	19	17,045
Lower South Umpqua WAU	58,281	55	1,678	2	897	1	1,424	1	12,753	12	3,440	3	181	0	98	0	43	0	27,430	26	106,225

Map 12. Lower South Umpqua Watershed Analysis Unit
1999 Private Age Class Distribution



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C. Interpretation

The differences between the historic and current vegetation conditions are due to land ownership patterns, fire suppression, timber harvesting, residential development, and to a lesser degree, natural disturbances. Historically, the early seral stage component was created by natural disturbances, primarily fire. Fires occurred in this WAU more frequently due to the Native Americans burning the grasslands in the valleys. Timber harvesting has created the early seral vegetation structure and pattern that currently exists in the forested upland areas of the WAU.

Table 11 compares the 1936 and 1999 vegetation data on BLM-administered lands. Although, the data may be correlated, a direct comparison cannot be made because the 1936 vegetation data is based on diameter and the 1999 vegetation data is based on age class.

Table 11. Comparison of 1936 Cover Type with 1999 Age Classes on BLM Administered Lands.

Approximate Seral Stage	1936 Cover Type			1999 Age Class		
		Acres	Percent		Acres	Percent
Early	Cut < 1920, Less Than 6"	34	1	0 to 30 Years Old	1,372	33
Mid	Conifer, 6-20"	636	15	30 to 60 Years Old	1,047	25
				60 to 80 Years Old	28	0
Late	Conifer, 20-40"	1,736	42	At Least 80 Years Old	1,567	38
	Conifer, Old-growth	1,404	34			
Interior Valley Hardwoods	Hardwood: Oak, madrone, chinkapin	-	-	-	-	-
Non-forest	Non-forest, Agricultural	344	8	Non-forest	140	4
Total		4,154	100		4,154	100

Bureau of Land Management administered lands available for intensive forest management are those lands outside of Riparian Reserves and other areas reserved or withdrawn from timber harvesting. The WAU contains approximately 2,835 acres (68 percent) of BLM-administered lands that are available for intensive forest management (see Table 12). Silvicultural practices including prescribed fire could be used to obtain desired vegetation conditions in special habitat areas.

Table 12. Acres of BLM Administered Land by Land Use Allocation.

	Reserved or Withdrawn		Connectivity/Diversity Block		GFMA		
Area	Acres	Percent	Acres	Percent	Acres	Percent	Total Acres
Brushy Butte	386	30	251	19	668	51	1,305
North Fork Deer Creek	246	38	0	0	406	62	652
South Fork Deer Creek	342	29	42	4	790	67	1,174
Deer Creek Subwatershed	974	31	293	9	1,864	60	3,131
Blackhole	197	32	0	0	420	68	617
Roseburg West Subwatershed	197	32	0	0	420	68	617
Callahan Creek	0	0	0	0	0	0	0
Champagne Creek	0	0	0	0	0	0	0
Elgarose	144	36	0	0	258	64	402
Wardton Subwatershed	144	36	0	0	258	64	402
Lower South Umpqua WAU	1,315	32	293	7	2,542	61	4,150

Management direction from the Northwest Forest Plan and the Roseburg District RMP states that 15 percent of all Federal lands, considering all Land Use Allocations, within fifth field watersheds should remain in late-successional forest stands. The Lower South Umpqua Watershed is a fifth field watershed. Approximately 38 percent (1,576 acres out of 4,155 acres) of the BLM-administered land within the Lower South Umpqua Watershed (the fifth field watershed) is in forest stands at least 80 years old (late-successional) (see Table 7). The Lower South Umpqua Watershed meets the Standard and Guideline to retain 15 percent of all Federal lands within fifth field watersheds in late-successional forest stands. Approximately ten percent (402 acres out of 4,155 acres) of the Lower South Umpqua Watershed is in late-successional forest stands and in reserved or withdrawn areas (see Table 13). Maintaining about 623 acres of late-successional forest stands on BLM-administered land would meet the Standard and Guideline to retain 15 percent of all Federal lands within fifth field watersheds in late-successional forest stands.

Table 13. Age Class Distribution in Reserved or Withdrawn Areas Within the Lower South Umpqua WAU.

	Number of Acres by Age Class and Percent of Total																		
Area	Nonforest	%	0 to 10	%	10 to 20	%	20 to 30	%	30 to 50	%	50 to 80	%	80 to 120	%	120 to 200	%	200 +	%	Total
Brushy Butte	9	2	50	13	50	13	71	18	12	3	13	3	12	3	27	7	143	37	387
North Fork Deer Creek	12	5	21	9	26	11	3	1	117	47	0	0	0	0	0	0	68	28	247
South Fork Deer Creek	8	2	18	5	18	5	80	23	126	37	0	0	6	2	39	11	48	14	343
Deer Creek Subwatershed	29	3	89	9	94	10	154	16	255	26	13	1	18	2	66	7	259	27	977
Blackhole	81	41	22	11	0	0	14	7	22	11	0	0	37	19	14	7	8	4	198
Roseburg West Subwatershed	81	41	22	11	0	0	14	7	22	11	0	0	37	19	14	7	8	4	198
Callahan Creek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Champagne Creek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elgarose	21	15	0	0	0	0	7	5	116	81	0	0	0	0	0	0	0	0	144
Wardton Subwatershed	21	15	0	0	0	0	7	5	116	81	0	0	0	0	0	0	0	0	144
Lower South Umpqua WAU	131	10	111	8	94	7	175	13	393	30	13	1	55	4	80	6	267	20	1,319

Matrix lands in the Lower South Umpqua WAU are to be managed for timber production to help meet the Probable Sale Quantity (PSQ) established in the Roseburg District RMP. If all of the Matrix lands greater than 80 years old were to be harvested about 28 percent (1,174 acres) of the BLM-administered lands would be affected. Table 14 and Map 13 show what the age class distribution would be based on a timber harvesting plan through the year 2024. The timber harvesting plan went through a rigorous process to identify suitable locations while evaluating impacts to wildlife, fisheries, and hydrology resources. The process attempted to adjust the scale, timing, and spacing of timber harvesting to minimize the effects on other resources. The planning process is described in more detail in Appendix I. The results of the process are shown on Map I-1. Table 15 compares the 1999 and 2024 age class distribution based on the same timber harvesting plan. The timber harvesting plan would maintain at least 30 percent of the WAU in late-successional forest in 2024.

Table 14. Potential 2024 Age Class Distribution.

	Number of Acres by Age Class and Percent of Total										
Area	Nonforest	%	0 to 30	%	30 to 60	%	60 to 80	%	At least 80 Years Old	%	Total
Brushy Butte	10	1	322	25	452	35	14	1	508	39	1,306
North Fork Deer Creek	12	2	83	13	113	17	288	44	156	24	652
South Fork Deer Creek	8	1	143	12	455	39	262	22	306	26	1,174
Deer Creek Subwatershed	30	1	548	17	1,020	33	564	18	970	31	3,132
Blackhole	84	14	109	18	63	10	106	17	255	41	617
Roseburg West Subwatershed	84	14	109	18	63	10	106	17	255	41	617
Callahan Creek	0	0	0	0	0	0	0	0	0	0	0
Champagne Creek	0	0	0	0	0	0	0	0	0	0	0
Elgarose	26	6	0	0	26	6	337	84	12	3	401
Wardton Subwatershed	26	6	0	0	26	6	337	84	12	3	401
Lower South Umpqua WAU	140	3	657	16	1,109	27	1,007	24	1,237	30	4,150

Map 13. Lower South Umpqua Watershed Analysis Unit
Potential 2024 Age Class Distribution on BLM Administered Land

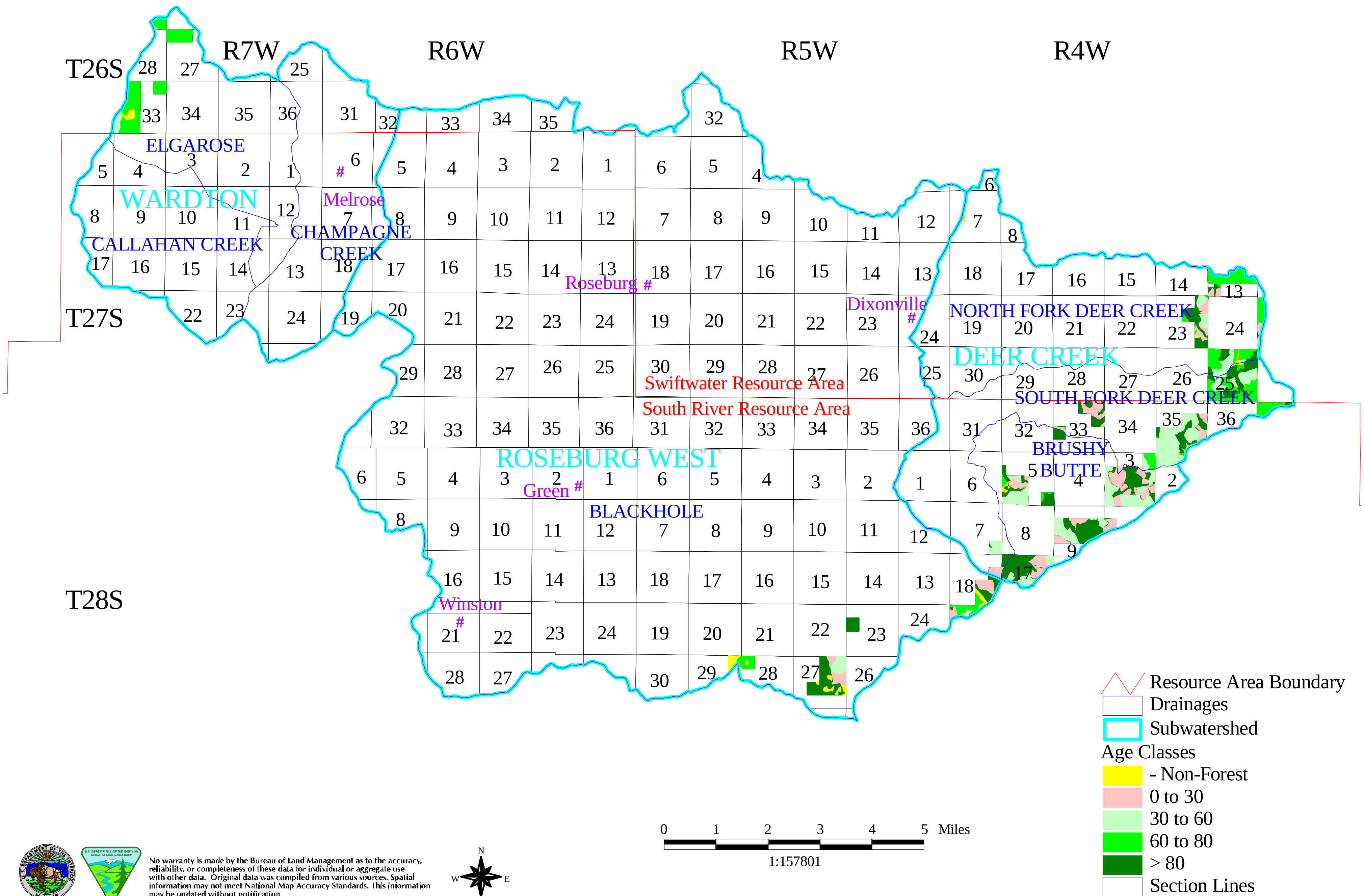


Table 15. Comparison of Age Class Distributions in the Lower South Umpqua WAU between 1999 and 2024 (based on a timber harvesting plan through 2024).

Age Classes	1999		2024	
	Acres	Percent	Acres	Percent
0 to 30 Years Old	1,370	33	657	16
30 to 80 Years Old	1,069	26	2,116	51
At Least 80 Years Old	1,576	38	1,237	30
Nonforest	140	3	140	3

1. Silviculture Actions

Silviculture actions would be based on Land Use Allocations. Intensive forest management activities would occur on General Forest Management Areas. Silviculture actions within Riparian Reserves would focus on stands regenerated following timber harvesting or stands that were thinned. Silvicultural practices applied within Riparian Reserves would be to control stocking, reestablish and manage stands, establish and maintain desired non-conifer vegetation, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.

a. Riparian Reserves

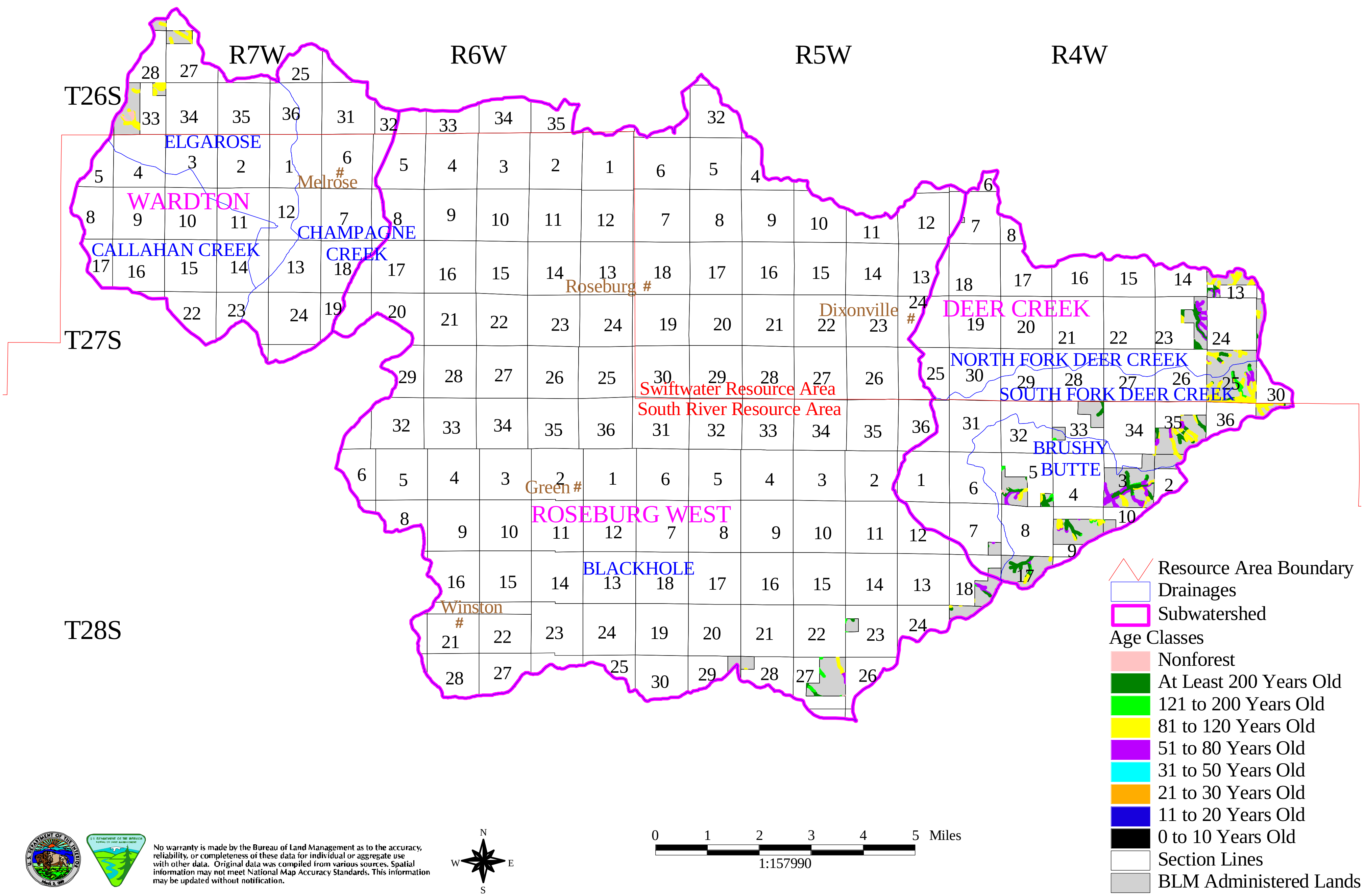
Commercial thinning or density management within overstocked Riparian Reserves would promote tree survival and growth. These activities would maintain or restore tree growth and vigor, reduce the probability of an insect infestation, maintain or enhance the existing diversity, and attain larger trees in a shorter time period. Excluding Riparian Reserves from commercial thinning/density management would limit tree growth, maintaining smaller diameter trees from which snags and down logs would be created. Activities within Riparian Reserves would be to acquire desired vegetative characteristics and to achieve Aquatic Conservation Strategy objectives.

In about 60 years approximately 80 percent of the Riparian Reserves would be at least 80 years old (see Table 16 and Map 14). In approximately 80 years, all of the forested Riparian Reserves would be at least 80 years old. Approximately two percent of the Riparian Reserves are considered to be nonforested.

Table 16. Percent of Riparian Reserves at Least 80 Years Old in the Lower South Umpqua Watershed (Fifth Field).

Year	1999	2009	2019	2029	2039	2049	2059	2069	2079
Percent	34	34	34	34	46	64	80	88	98

Map 14. Lower South Umpqua Watershed Analysis Unit
Riparian Reserve Age Class Distribution in 2059



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b. Matrix Land Use Allocation

Providing a sustainable supply of timber and other forest products and early-successional habitat are two objectives of the Matrix Land Use Allocation. Silvicultural prescriptions would be planned to produce, over time, forests with the desired species compositions, structural characteristics, and distribution of seral classes. The Matrix Land Use Allocation is composed of 2,542 acres in General Forest Management Areas and 293 acres in Connectivity/Diversity Blocks.

(1) Site Preparation, Reforestation, and Maintenance

Regeneration of newly harvested areas is usually achieved by planting seedlings following site preparation. Genetically selected stock would be planted, when available. A mixture of species appropriate to the site would be planted, monitored, and maintained. Vegetation treatments may be necessary to allow seedlings to become established. Mulching to reduce competition from grass may be necessary at lower elevations where grass can affect seedling survival. Brush competition may also affect seedling survival.

(2) Precommercial Thinning

Precommercial thinning maintains stand vigor and controls species composition and stand density. Stand density is usually reduced to approximately 250 trees per acre. Stands between ten and 15 years old with high tree densities are the typical type of precommercially thinned stand. Over 200 acres in the WAU could be precommercially thinned at this time. Another 450 acres could be precommercially thinned within the next ten years. Nearly 1,000 acres in the WAU have been precommercially thinned since the 1960s. Stands may be fertilized following precommercial thinning.

(3) Fertilization

Thinned stands could be fertilized to increase diameter and height growth, improve tree vigor, and maintain live crown ratio. Fertilization actions would be designed to apply 200 pounds of available nitrogen in the form of urea based prill by helicopter. Fertilizing unthinned stands could be used to imitate the effects of precommercial thinning by accelerating the mortality of suppressed trees.

(4) Pruning

Pruning young stands increases wood quality through the production of clear wood in a shorter amount of time than would be required without the action. Stands on higher quality sites could be pruned following precommercial thinning. Trees would be pruned to nine or 18 feet from the ground depending on the height of the tree. Trees would be pruned to retain more than 50 percent of the live crown.

(5) Commercial Thinning/Density Management

One objective of the Matrix Land Use Allocation is to provide a sustainable supply of timber and other forest commodities. Commercial thinning in GFMA or density management in Connectivity/Diversity Blocks would be conducted where practical and where increased gains in timber production are likely. Thinning intervals may range from ten to 30 years. Thinning intervals may vary by site class, with poor sites having longer intervals.

Commercial thinnings generally occur in 40 to 60 years old stands. About 300 acres in the WAU could be commercially thinned. Density Management could occur in stands up to 120 years old. Density management could occur on approximately 360 acres in the WAU. The locations of stands where potential commercial thinning or density management activities could be conducted are shown on Map 15.

Stands considered suitable for commercial thinning stands generally have a closed canopy, dead lower limbs, dead standing and down trees, and slowed tree growth. These conditions indicate mortality is occurring in the suppressed and intermediate sized trees. Suppression mortality occurs in stands with a relative density index greater than 65 percent (using the Organon growth and yield model), which is considered the lower limit of competition mortality. Relative Density Index (RDI) is the ratio of actual stand density to the maximum stand density attainable in a stand with the same mean tree volume (Drew and Flewelling 1979). Thinning should maintain the stand with a relative density index between 40 and 65 percent (using Organon). The relative density index in Connectivity/Diversity Blocks could be lower to encourage understory development.

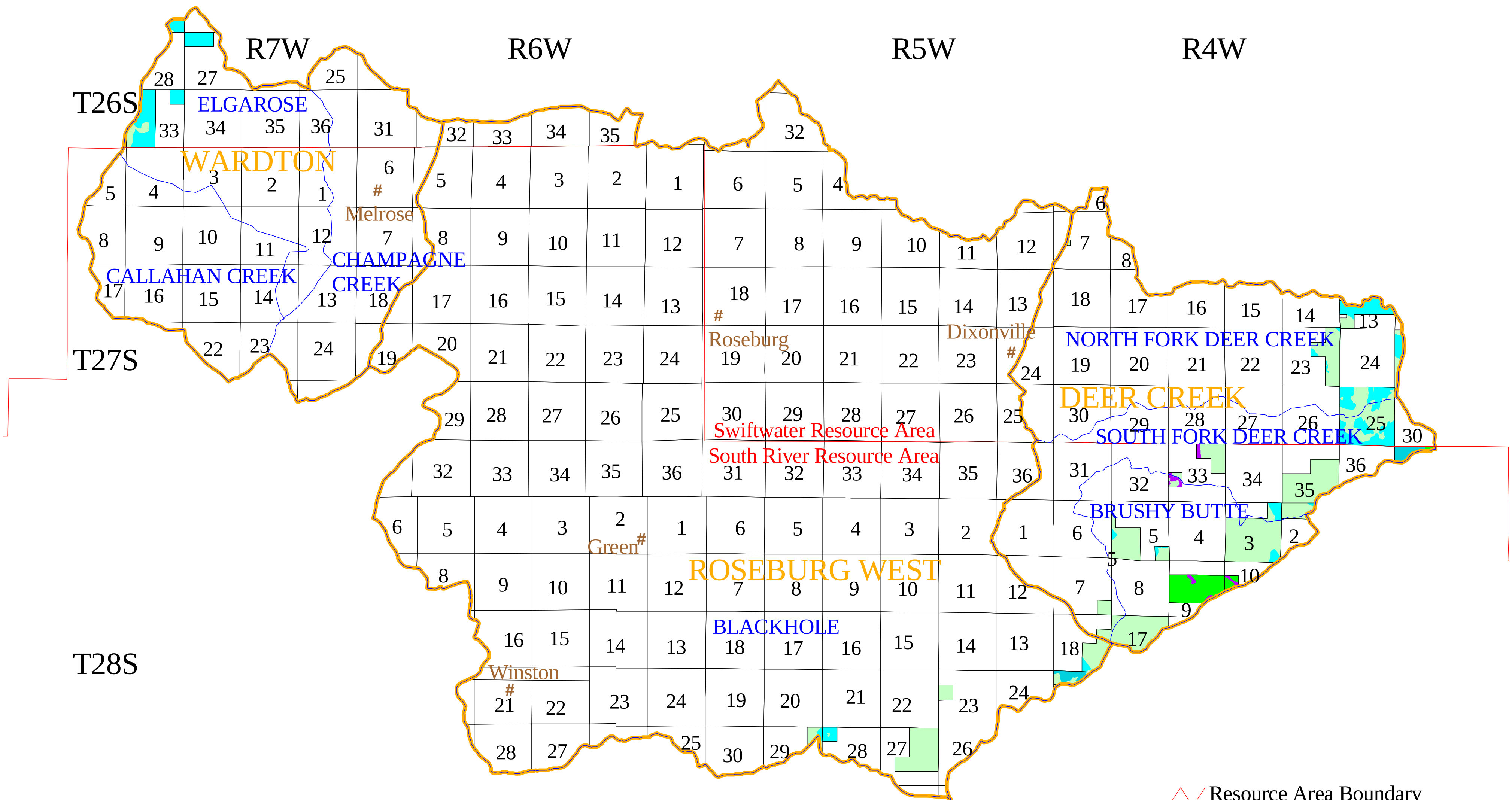
In Connectivity/Diversity Blocks, density management would provide habitat for a variety of organisms associated with both late-successional and younger forests. Commercial thinning would be designed to produce high volume productivity levels. Density management would accelerate development into a multilayered stand with large trees, canopy gaps for spatial diversity and understory development, snags, and large down wood. Unthinned patches could be retained to provide wildlife habitat. Treatments could take advantage of opportunities to optimize habitat for late-successional forest related species in the short term. Stands between 80 and 120 years old that currently exhibit late-successional or old-growth characteristics could be retained without density management, unless they are identified as needing treatment as part of a risk reduction effort.

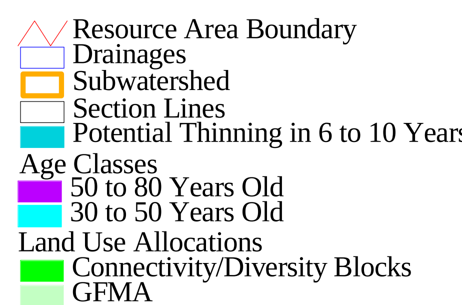
(6) Regeneration Harvests

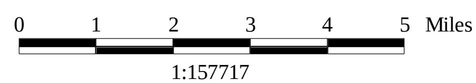
Late seral stands comprise approximately 38 percent of the Matrix Land Use Allocation in the WAU. Most regeneration harvest would occur in the late seral stands. These stands would help provide a sustainable supply of timber and other forest commodities.

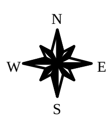
The GFMA Land Use Allocation contains approximately 1,366 acres greater than 80 years old. Regeneration harvests would be programmed for stands at least 60 years old. Long term rotation age

Map 15. Lower South Umpqua Watershed Analysis Unit
Potential Commercial Thinning or Density Management Stands on BLM Administered Land









would be planned for culmination of mean annual increment (CMAI), which generally occurs when a stand is between 80 and 110 years old, in this area. The modified reserve seed-tree method of harvest removes the majority of a stand in a single entry except for six to eight conifer trees per acre. Coarse woody debris and snags would be retained to meet management objectives.

Connectivity/Diversity Blocks contain approximately 201 acres greater than 80 years old. Connectivity/Diversity Blocks provide important ecological functions, such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components, such as down logs, snags, and large trees. Regeneration harvests would be programmed in late-successional stands. Connectivity/Diversity Blocks would be managed using a 150 year area control rotation. Between 12 and 18 green conifer trees per acre and 120 linear feet of viable down logs per acre would be left within regeneration harvest units. At least 25 percent of each Connectivity/Diversity Block would be maintained in late-successional forests.

There are two Connectivity/Diversity Blocks in the Lower South Umpqua WAU. The Connectivity/Diversity Blocks contain more than 25 percent in late-successional forests (see Table 17). The Connectivity/Diversity Blocks meet the Standard and Guideline to maintain at least 25 percent of each Connectivity/Diversity Block in late-successional forests. One of the Connectivity/Diversity Blocks has more than 25 percent of the reserved areas in late-successional forests.

Table 17. Acres of Late Successional Stands in Connectivity/Diversity Blocks in the Lower South Umpqua WAU.

Connectivity/Diversity Block	Total Acres in Block	Amount of Reserved or Withdrawn Areas 80 Years Old or Older		Total Area 80 Years Old or Older	
		Acres	Percent	Acres	Percent
Block 14	372	38	10	226	61
Block 17	529	175	33	383	72

2. Fire and Fuels Management

Treatments of natural fuels may be planned near areas with high recreation use, along heavily traveled road corridors, or in forest stands to reduce the risks of a wildfire, improve habitat of special status species, or improve forest health. Prescribed underburning, pile burning, and manual or mechanical treatments could be used in areas where wildfire exclusion has resulted in natural fuel accumulations considered to be unnatural and wildfire is considered to be a high risk to forest resources. Extensive fuels management treatments are difficult to justify for the sole reason of wildfire risk reduction. Other site specific resource objectives would normally be the basis for prescribing a fuels treatment on natural forest fuels. Prescribed broadcast burning poses risks that in many cases would outweigh potential risk reduction benefits. Prescribed broadcast burning, pile burning, manual or mechanical fuels treatments, or fuels removal would be applied primarily on activity fuels created from timber management operations.

Fire management in the Lower South Umpqua WAU would continue to require an aggressive suppression strategy on all unplanned wildland fires. The Roseburg District Fire Management Plan, prepared June 1998, identified appropriate fire management activities for Matrix, Riparian Reserve, and Late-Successional Reserve Land Use Allocations. The Fire Management Plan also identified three categories of fire management or protection that covers all Land Use Allocations. The fire prevention contract with The Oregon Department of Forestry requires all unplanned wildland fires to be suppressed. Additionally, the initial attack standards are to control 94 percent of all fires before they reach ten acres in size.

V. Geology, Soils, and Erosion Processes

A. Geology

The Lower South Umpqua WAU is comprised of sedimentary, igneous, and metamorphic rocks. Geology of the WAU is shown on Map 16. Unit descriptions are from the Geologic Map of Oregon by George W. Walker and Norman S. MacLeod (1991).

Jop

Otter Point Formation of Dott (1971) and related rocks (Upper Jurassic) - Highly sheared graywacke, mudstone, siltstone, and shale with lenses and pods of sheared greenstone, limestone, chert, blueschist, and serpentine.

Ju

Ultramafic and related rocks of ophiolite sequences (Jurassic) - Predominantly harzburgite and dunite with both cumulate and tectonite fabrics. Locally altered to serpentinite. Includes gabbroic rocks and sheeted diabasic dike complexes.

KJds

Sedimentary rocks - Sandstone, conglomerate, graywacke, rhythmically banded chert lenses.

KJdv

Sedimentary and volcanic rocks - Volcanic rocks, basaltic pillow lavas, volcanic breccia, and silicified basalt lava flows.

KJg

Granitic rocks (Createaceous and Jurassic) - Mostly tonality and quartz diorite but including lesser amounts of other granitoid rocks.

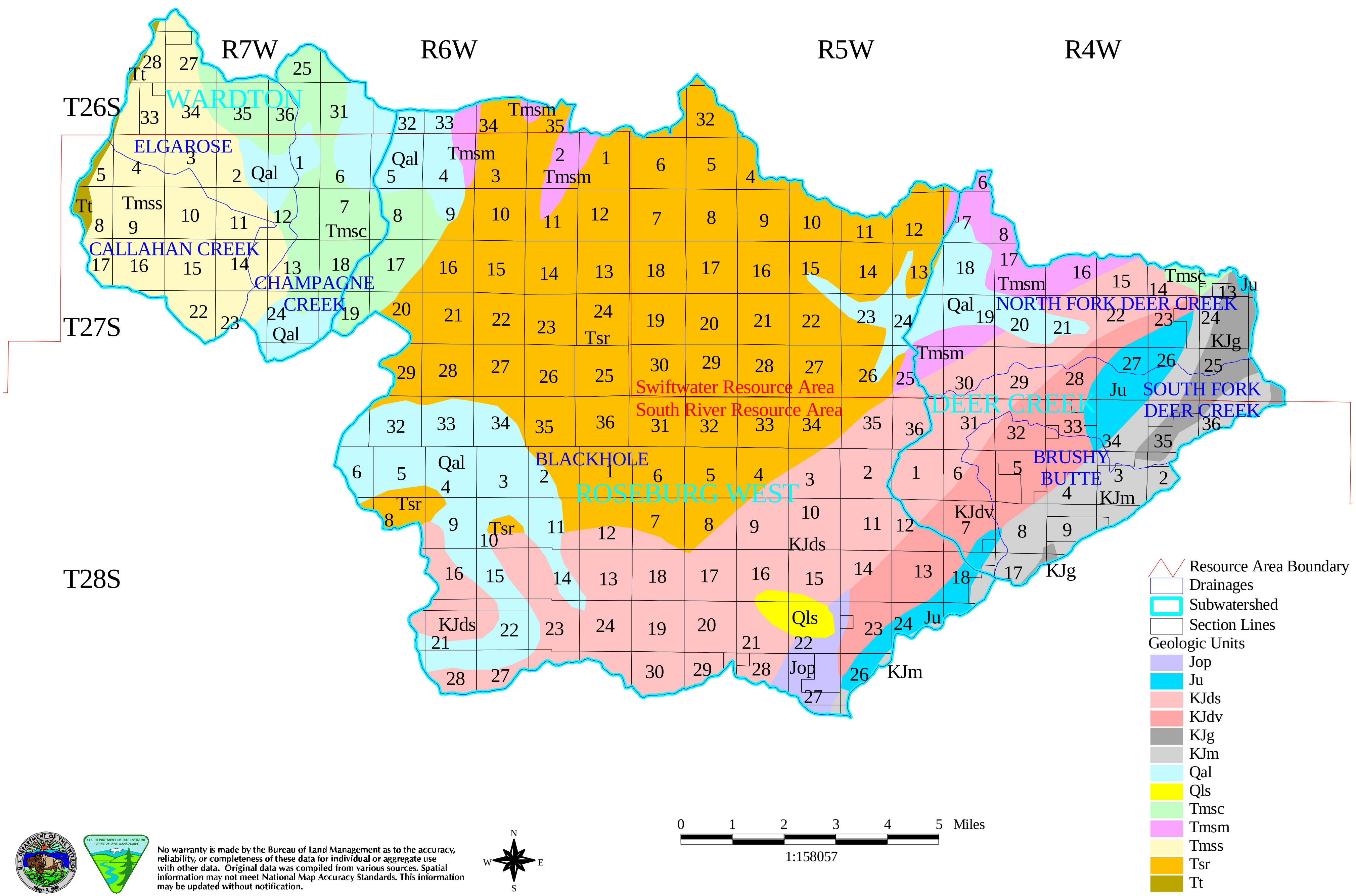
KJm

Myrtle Group (Lower Cretaceous and Upper Jurassic) - Conglomerate sandstone, siltstone, and limestone. Locally fossiliferous.

Qal

Alluvial deposits (Holocene) - Sand, gravel, and silt forming floodplains and filling channels of present streams. In places includes talus and slope wash.

Map 16. Lower South Umpqua Watershed Analysis Unit
Geology



Qls

Landslide and debris-flow deposits (Holocene and Pleistocene) - Unstratified mixtures of fragments of adjacent bedrock. Locally includes slope wash and colluvium.

Tmsc

Marine siltstone, sandstone, and conglomerate (lower Eocene) - Massive to thin-bedded cobble and pebble conglomerate, pebbly sandstone, lithic sandstone, siltstone, and mudstone. Shelf and slope depositional setting. The mudstones are exposed primarily along Boulder and Dice Creeks with pebbly conglomerate, sandstones, and minor amounts of subbituminous coal, thin beds of fine-grained sandstone, and carbonaceous siltstone covering the majority of the southern part of the WAU.

Tmsm

Marine siltstone, sandstone, and conglomerate (lower Eocene) - Cobble and pebble conglomerate pebbly sandstone, lithic sandstone, siltstone, and mudstone. Massive to thin bedded. Shelf and slope depositional setting.

Tmss

Marine sandstone and siltstone (middle Eocene) - Thin to thick bedded, crossbedded, well-sorted fine to medium grained sandstone, siltstone, and mudstone characterized by sparse white mica. Shallow marine depositional setting partly of deltaic origin.

Tsr

Siletz River Volcanics and related rocks (middle and lower Eocene and Paleocene) - Aphanitic to porphyritic, vesicular pillow flows, tuff-breccias, massive lava flows and sills of tholeiitic and alkalic basalt. Upper part of sequence contains numerous interbeds of basaltic siltstone and sandstone, basaltic tuff, and locally derived basalt conglomerate. Rocks of unit pervasively zeolitized and veined with cakite. Most of these rocks are of marine origin and have been interpreted as oceanic crust and seamounts.

Tt

Tyee Formation (middle Eocene) - Thick sequence of rhythmically bedded, medium to fine-grained micaceous, feldspathic, lithic, or arkosic marine sandstone and micaceous carbonaceous siltstone. Contains minor beds of dacite tuff in upper part of unit. Groove and flute casts indicate deposition by north flowing turbidity currents.

B. Soils

1. Historic and Current Conditions

The main sources of information for the soils section are the National Cooperative Soil Survey (NCSS) of Douglas County, conducted by the Natural Resources Conservation Service (NRCS) and the Timber Production Capability Classification (TPCC) conducted by the Bureau of Land Management. The Douglas County Soil Survey was mapped at an order 2 to order 3 level of detail. Tables and maps built from NCSS data include private as well as BLM-administered lands. Tables and maps built from TPCC data only include information from BLM-administered lands.

Soils in the Lower South Umpqua Watershed Analysis Unit (WAU) have developed dominantly from sedimentary, igneous, and metamorphic parent materials mostly in the Coast Range Geomorphic Province. The WAU contains minor influences from the Klamath Mountains Province.

a. Soil Parent Material Groups

The National Cooperative Soil Survey of Douglas County was used to group soils by parent material type (see Map 17 and Appendix J). The information describes soil characteristics, qualities, and properties.

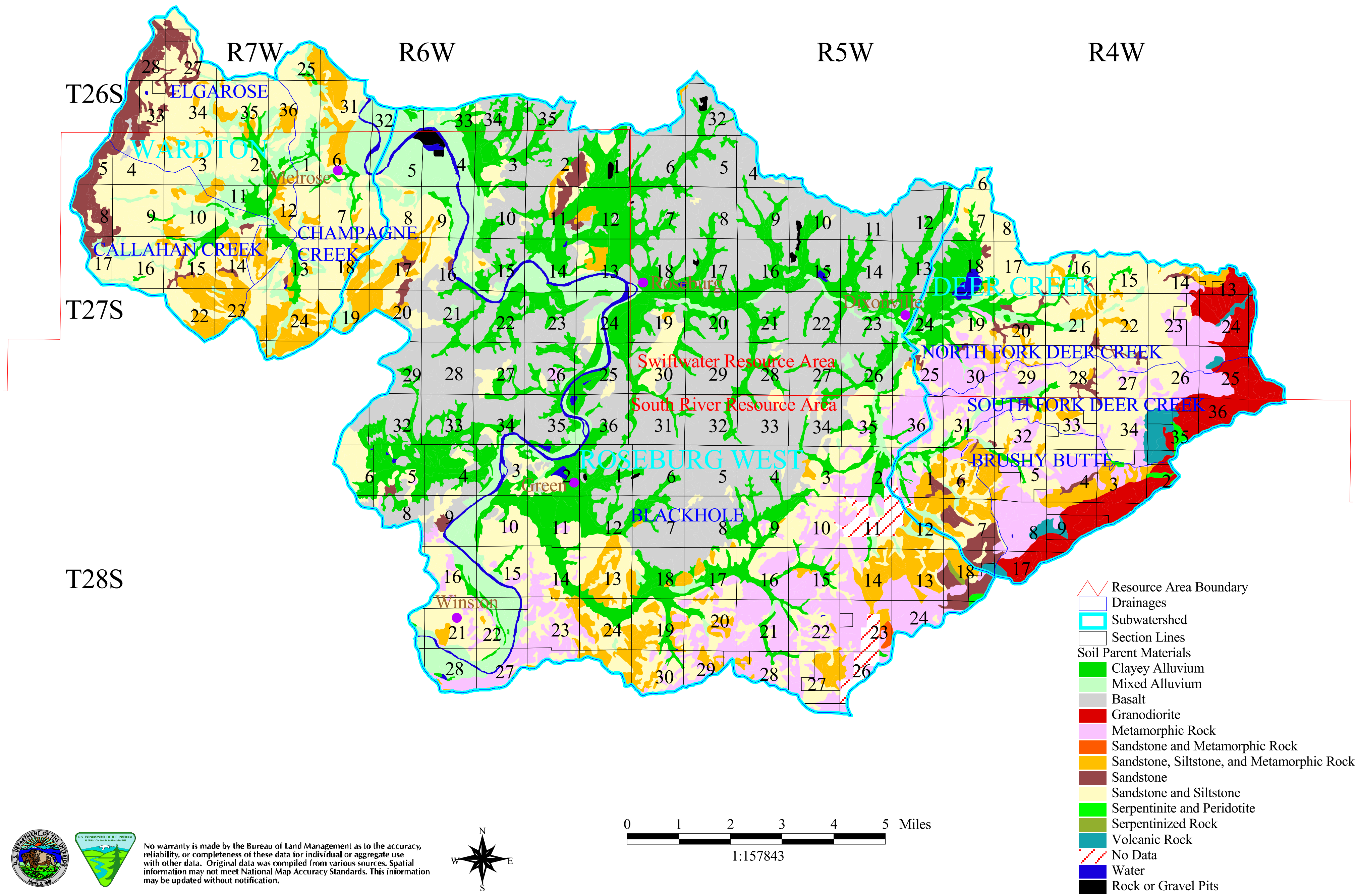
(1) Sandstone and Siltstone Parent Material

Sandstone and siltstone parent materials cover approximately 26 percent of the WAU. They occur in the northwest portion of the WAU. These soils formed on upland hill slopes and foot slopes. The average depth to weathered and unweathered bedrock is 48 inches. Sandstone and siltstone soils are moderately well drained with an average subsoil clay content of 42 percent. Permeability is moderate. Runoff is moderate. Sandstone and siltstone soils have some of the most erodible bare surface soils in the WAU.

(2) Basalt Parent Material

Basalt parent materials cover approximately 24 percent of the WAU. They occur in the middle of the WAU. These soils formed on basalt uplands. The average depth to weathered bedrock is 22 inches. Basalt soils are well drained with an average subsoil clay content of 50 percent. Shrink and swell cracks due to the expansion (wet) and contraction (dry) of the clay minerals may appear on the surface in the summer. Permeability is low and runoff is high.

Map 17. Lower South Umpqua Watershed Analysis Unit
Soil Parent Materials



(3) Clayey Alluvium Parent Material

Clayey Alluvium covers approximately 16 percent of the WAU. These soils are found on floodplains and terraces. Sediments were deposited mostly from the surrounding basalt hills. Soil depths average greater than 60 inches to bedrock. Clayey alluvium soils are somewhat poorly drained with an average subsoil clay content of 60 percent. Permeability is low and runoff is high. Clayey alluvium soils have the highest surface pH and cation exchange capacity. This indicates clayey alluvium is the most fertile of the parent material groups in the WAU.

(4) Metamorphic Parent Material

Metamorphic parent materials cover approximately ten percent of the WAU. They occur mainly in the southeast portion of the WAU. Metamorphic soils formed on upland hill slopes. The average depth to hard bedrock is 30 inches. Metamorphic soils are well drained with an average subsoil clay content of 30 percent. Permeability is moderate. Runoff is moderate.

(5) Mixed Alluvium Parent Material

Mixed Alluvium covers approximately eight percent of the WAU. These soils occur mainly on alluvial fans and high terraces along the South Umpqua River. Mixed alluvium soil depths are typically greater than 60 inches to bedrock. These soils are well drained with an average subsoil clay content of 27 percent. Permeability is moderate and runoff is moderate. Mixed alluvium soils have some of the most erodible bare surface soils in the WAU, according to the K factor values (see Appendix J).

(6) Sandstone Parent Material

Sandstone parent materials cover approximately three percent of the WAU. They occur in the eastern and western, along Callahan Ridge, portions of the WAU. These soils formed on upland ridges, hill slopes and foot slopes. The average depth to hard bedrock is 36 inches. Sandstone soils are well drained on hill slopes and poorly drained on foot slopes. Average subsoil clay content is 32 percent. Permeability is moderate. Runoff is moderate on the hill slopes and high on the foot slopes.

(7) Granitic Parent Material

Granitic parent materials cover approximately three percent of the WAU. They occur in the higher elevations of the eastern potion of the WAU. These soils formed on mountain sides. The average depth to weathered bedrock is 57 inches. Granitic soils are mostly well drained with an average subsoil clay content of 32 percent. Permeability is moderate and runoff is moderate. Granitic soils have a low subsoil cation exchange capacity and low pH. This indicates granitic soils have low plant nutrient availability and low subsoil fertility.

b. National Cooperative Soil Survey (NCSS) Information

The main soils related properties considered to be significant for planning and analysis, using the NCSS, are hydric, floodplain, somewhat poorly drained, serpentine, granitic, and prime farmland soil types (see Table 18 and Map 18).

(1) Floodplain Soils

There are approximately 4,603 acres of floodplain soils on private land and 0 acres on BLM-administered land. The floodplain soils occur mostly in the Blackhole, Champagne Creek and North Fork Deer Creek Drainages. Smaller amounts of floodplain soils occur in the South Fork Deer Creek, Callahan Creek and Elgarose Drainages. Floodplain management objectives on BLM-administered land include A) Reduce the risk of flood loss or damage to property. B) Minimize the impact of flood loss on human safety, health and welfare. C) Restore, maintain and preserve the natural and beneficial functions of floodplains.

(2) Somewhat Poorly Drained (SWP) Soils

There are approximately 12,131 acres of somewhat poorly drained soils on private land and 325 acres on BLM-administered land. Most of these soil types occur in the Blackhole Drainage. Somewhat poorly drained soils usually have a seasonal high water table within 18 inches of the soil surface. These soil types may include riparian and slope stability problem areas. Windthrow hazards can occur more often on these soils. Hydric or wet soil areas too small for mapping (NCSS standards <5 acres) exist as minor components within areas mapped as somewhat poorly drained.

(3) Somewhat Poorly Drained - Floodplain Soils

There are approximately 500 acres of somewhat poorly drained - floodplain soils on private land and 0 acres on BLM-administered land. Most of these soil types occur in the Blackhole Drainage.

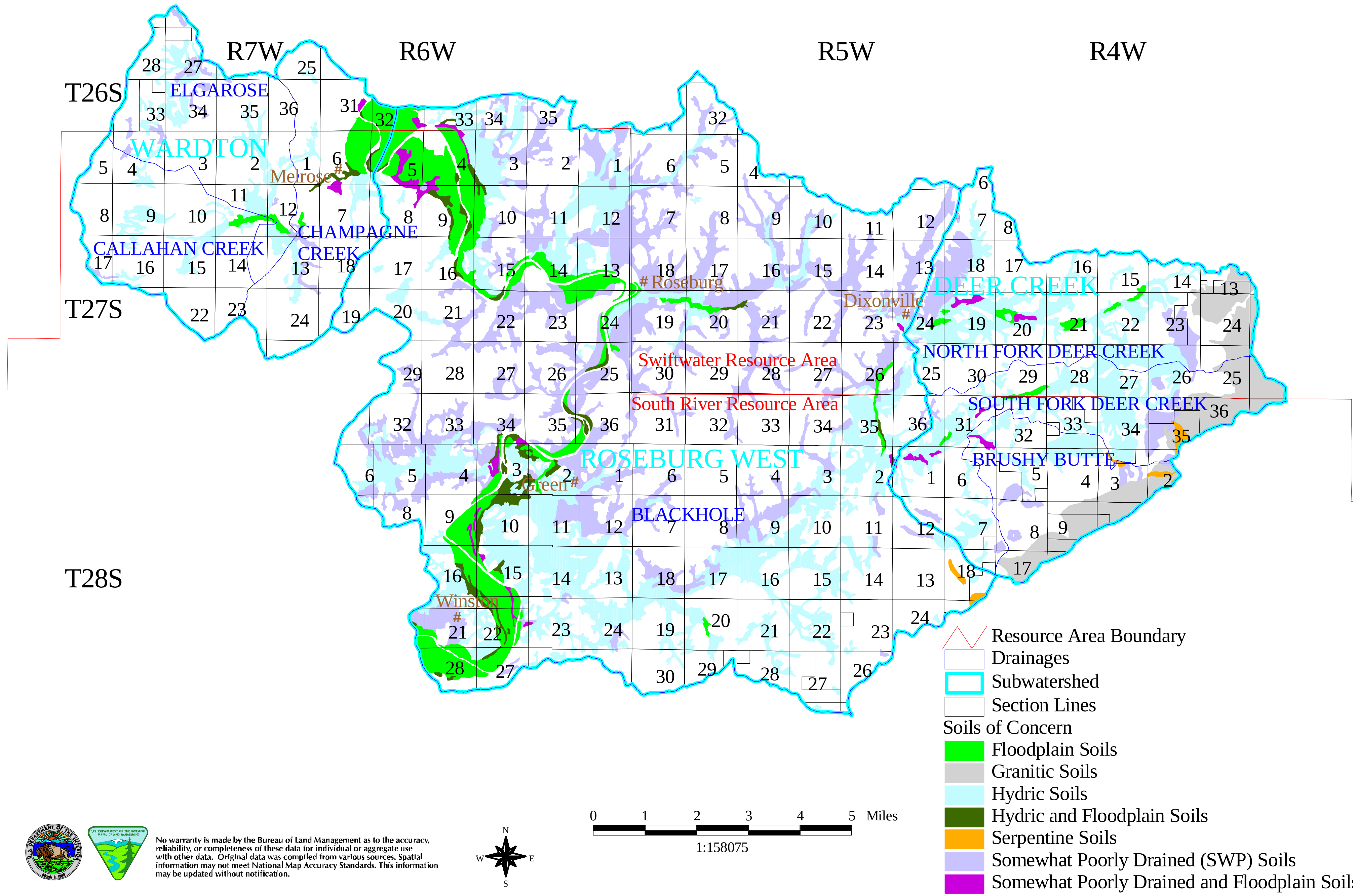
(4) Hydric Soils

There are approximately 16,864 acres of hydric soils occurring on private land and 52 acres on BLM-administered land. Most of these soil types occur in the Blackhole, North Fork Deer Creek, and South Fork Deer Creek Drainages. Hydric soils generally have a watertable within ten inches of the soil surface for at least five percent of the growing season. The current definition of a hydric soil from the NRCS is "a soil that is sufficiently wet in the upper part to develop anaerobic conditions during the growing season." These areas have the greatest potential to be classified as wetlands.

Table 18. Soil Management Concerns Within the Lower South Umpqua WAU.

Drainage	Acres of Floodplain Soils		Acres of Somewhat Poorly Drained Soils		Acres of Somewhat Poorly Drained - Floodplain Soils		Acres of Hydric Soils		Acres of Hydric - Floodplain Soils		Acres of Serpentine Soils		Acres of Granitic Soils		Acres of Prime Farmland Soils	
	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private
Brushy Butte	0	0	121	78	0	30	2	520	0	0	8	43	638	511	0	30
North Fork Deer Creek	0	150	59	714	0	65	5	2,158	0	0	0	0	264	545	0	249
South Fork Deer Creek	0	55	134	248	0	45	6	2,108	0	0	62	6	464	588	0	188
Deer Creek Subwatershed	0	205	314	1,040	0	140	13	4,786	0	0	70	49	1,366	1,644	0	467
Blackhole	0	3,739	0	10,729	0	319	31	10,301	0	724	32	29	0	0	0	4,025
Roseburg West Subwatershed	0	3,739	0	10,729	0	319	31	10,301	0	724	32	29	0	0	0	4,025
Callahan Creek	0	59	0	30	0	0	0	529	0	0	0	0	0	0	0	529
Champagne Creek	0	561	0	94	0	41	0	341	0	66	0	0	0	0	0	1,136
Elgarose	0	39	11	228	0	0	8	907	0	0	0	0	0	0	0	930
Wardton Subwatershed	0	659	11	352	0	41	8	1,777	0	66	0	0	0	0	0	2,595
Lower South Umpqua WAU	0	4,603	325	12,121	0	500	52	16,864	0	790	102	78	1,366	1,644	0	7,087

Map 18. Lower South Umppqua Watershed Analysis Unit
Soils of Managment Concern



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data was compiled from various sources. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

(5) Hydric - Floodplain Soils

There are approximately 790 acres of hydric - floodplain soils on private land and 0 acres on BLM-administered land. These soil types are located in the Blackhole and Champagne Creek Drainages.

(6) Serpentine Soils

There are approximately 78 acres of serpentine soils on private land and 102 acres on BLM-administered land. These soil types occur in the South Fork Deer Creek, Blackhole, and Brushy Butte Drainages. Serpentine soils generally have high amounts of magnesium and iron and low amounts of nitrogen, phosphorus, potassium and molybdenum. Productivity of Douglas-fir is poor. However, grasses grow rapidly. Conversion from native forest vegetation to other commercial forest types is difficult. Serpentine areas are usually associated with geologic contact zones that indicate increases in groundwater and decreases in slope stability.

(7) Granitic Soils

There are approximately 1,644 acres of granitic soils on private land and 1,366 acres on BLM-administered land. These soil types occur in the Brushy Butte, South Fork Deer Creek, and North Fork Deer Creek Drainages. Granitic soils are highly susceptible to surface erosion and shallow slope failure. They have low organic carbon reserves and are not very resilient.

Approximately 742 acres of the granitic soils on BLM-administered land occur on slopes greater than 35 percent. These are classified as Category 1 soils. Category 1 soils are considered highly sensitive to prescribed slash burning. About 36 percent of the granitic soils in the Brushy Butte Drainage, 12 percent in the South Fork Deer Creek Drainage, and five percent in the North Fork Deer Creek Drainage are considered to be Category 1 soils.

(8) Prime Farmland Soils

There are approximately 7,087 acres of prime farmland soils on private land and 0 acres on BLM-administered land. Most of these soil types occur in the Blackhole, Champagne Creek, Elgarose, and Callahan Creek Drainages. Prime farmland soils in the WAU were formed in loamy alluvium. Prime Farmland has the combination of soil properties, low slope gradient, growing season, and moisture supply to produce sustained high yield crops. The Farmland Protection Policy Act, published in the Federal Register, Vol. 43, No. 21, January 31, 1978, directs federal agencies to identify and take into account the adverse effects of federal programs on the preservation of prime farmland.

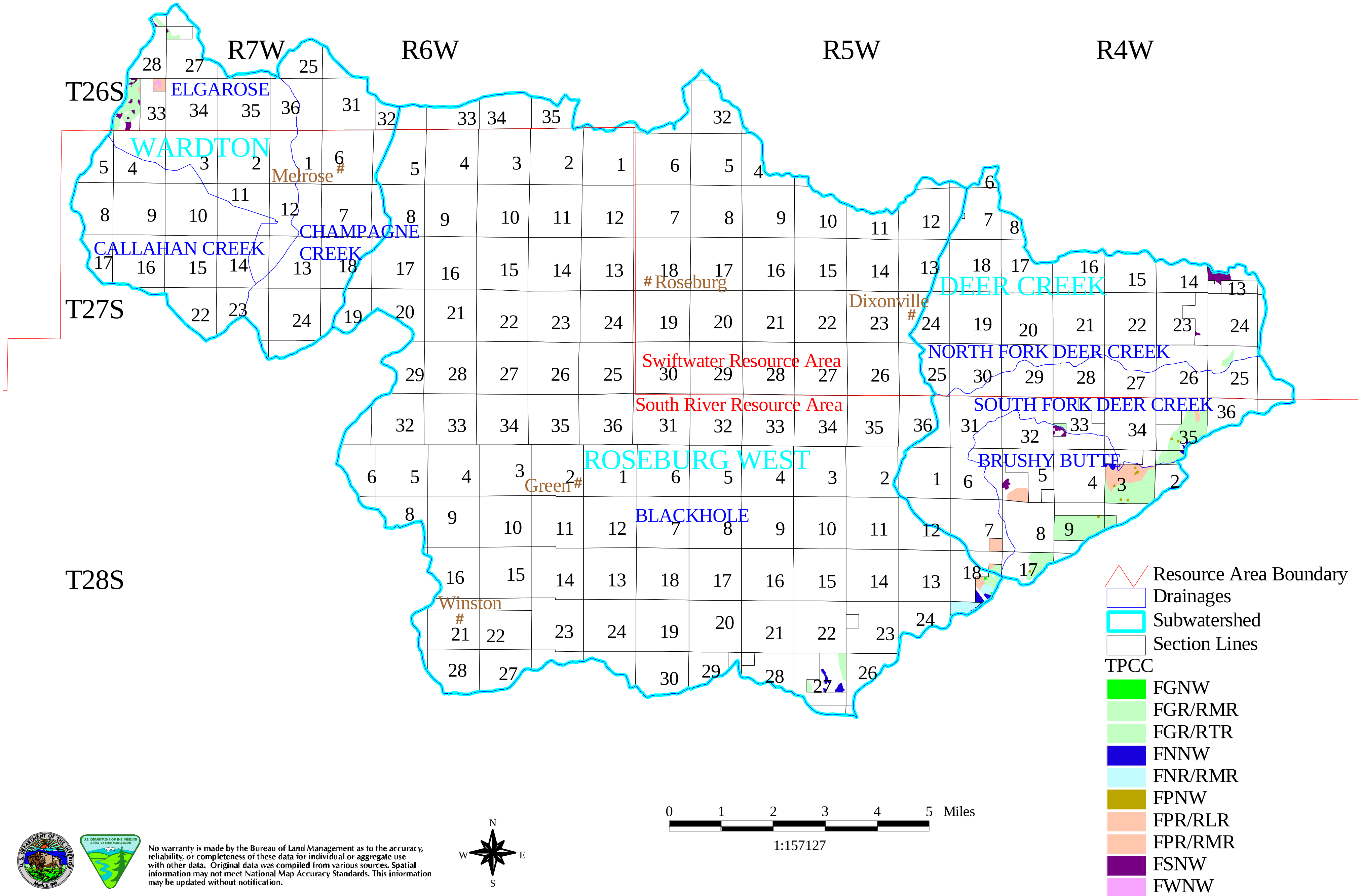
c. Timber Production Capability Classification (TPCC) Information, Fragile Sites

Additional soils related data determined to be significant for planning and analysis, using the Timber Production Capability Classification (TPCC), are the Fragile-Suitable and Fragile-Nonsuitable Classifications (see Table 19 and Map 19). Timber Production Capability Classification Fragile sites refer to those areas where the timber growing potential may be reduced due to inherent soil properties and landform characteristics. The TPCC groups sites into Fragile - Suitable and Fragile - Nonsuitable for timber production classifications. Fragile - Suitable sites have the potential for unacceptable soil productivity losses as a result of forest management activities unless mitigating measures are applied to protect the soil/site productivity (see Best Management Practices, Appendix D, Roseburg District Resource Management Plan, USDI 1995). Fragile Nonsuitable sites are considered to be unsuitable for timber production. Table 19 lists the number of acres in each classification on BLM-administered land within the WAU.

Table 19. Acres of Fragile Site Classifications on BLM Administered Lands From the Timber Production Capability Classification.

	Acres by Fragile Site Classification							
Drainage	FSNW	FNR	FNNW	FGR	FGNW	FPR	FPNW	FWNW
Brushy Butte	24	0	11	683	0	228	8	0
North Fork Deer Creek	54	0	0	22	0	52	0	0
South Fork Deer Creek	0	0	11	305	0	65	2	0
Deer Creek Subwatershed	78	0	22	1,010	0	345	10	0
Blackhole	0	91	52	90	2	22	0	0
Roseburg West Subwatershed	0	91	52	90	2	22	0	0
Callahan Creek	0	0	0	0	0	0	0	0
Champagne Creek	0	0	0	0	0	0	0	0
Elgarose	34	0	0	172	0	37	0	5
Wardton Subwatershed	34	0	0	172	0	37	0	5
Lower South Umpqua WAU	112	91	74	1,272	2	404	10	5

Map 19. Lower South Umpqua Watershed Analysis Unit
Fragile Soil Classifications from the Timber Production Capability Classification (TPCC)



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(1) Soil Moisture (FS)

Soils on these sites are typically moisture deficient due to soil physical characteristics. These sites are not considered moisture deficient due to competing vegetation or annual precipitation.

(a) Suitable (FSR)

These soils typically have loamy fine sands and sandy loam textures with high amounts of coarse fragments. They generally have between one and one and a half inches of available water holding capacity in the top 12 inches.

(b) Nonsuitable (FSNW)

These soils typically have textures that are dominantly gravelly sands or sands. They have less than one inch of available water holding capacity in the top 12 inches. These soil types occur in the Brushy Butte, North Fork Deer Creek, and Elgarose Drainages.

(2) Nutrient (FN)

Soils on these sites are inherently low in nutrients or have a nutrient imbalance that inhibits tree growth.

(a) Suitable (FNR)

Forest management activities would not reduce site productivity below the threshold of commercial forest land (20 cubic feet per acre per year). The Blackhole Drainage has approximately 91 acres of this classification type.

(b) Nonsuitable (FNNW)

Forest management activities could reduce site productivity below the threshold of commercial forest land of 20 cubic feet of wood production per acre per year. This classification type occurs in Brushy Butte, South Fork Deer Creek, and Blackhole Drainages.

(3) Slope Gradient (FG)

These sites have steep to extremely steep slopes with a high potential for debris type landslides. Gradients commonly range from 60 to more than 100 percent. Classifications are based on geology, geomorphology, physiographic position, climate (especially precipitation), soil types, and other factors.

(a) Suitable (FGR)

These sites are less fragile than the nonsuitable areas. Unacceptable soil and organic matter losses may occur on these sites from mass soil movement as a result of forest management activities unless mitigating measures (Best Management Practices) are used to protect the soil/growing site. This classification type occurs in Brushy Butte, North Fork Deer Creek, South Fork Deer Creek, Blackhole, and Elgarose Drainages.

(b) Nonsuitable (FGNW)

Unacceptable soil and organic matter losses could occur from mass soil movement as a result of forest management activities. These losses cannot be mitigated even using Best Management Practices. Approximately two acres of this classification occur in the Blackhole Drainage.

(4) Mass Movement Potential (FP)

These sites consist of deep seated, slump, or earth flow types of mass movements with undulating topography and slope gradients generally less than 60 percent.

(a) Suitable (FPR)

These sites may contain soil tension cracks and/or sag ponds. Trees on these sites may be curved at the base and/or along the stem. Forest management is feasible since the movement rate is slow. This classification type occurs in the Brushy Butte, North Fork Deer Creek, South Fork Deer Creek, Blackhole, and Elgarose Drainages.

(b) Nonsuitable (FPNW)

These sites have active, deep-seated slump-earthflow types of mass movements. They include areas where soils have been removed and do not currently produce commercial forest stands. The rate of movement may result in jackstrawed trees. Forest management is not feasible on these sites due to the rate of movement. These sites are rare and usually small in size. The Brushy Butte and South Fork Deer Creek Drainages have small amounts of this classification.

(5) Groundwater (FW)

These soils contain water at or near the soil surface for sufficient periods of time such that vegetation survival and growth are affected.

(a) Suitable (FWR)

Conifer production is usually limited due to excessive groundwater. These sites may or may not have water tolerant species. Soils typically have high chroma mottles close to the surface. Groundwater is usually altered when a site is disturbed but the productivity loss is considered to be acceptable. Forest management activities would not reduce site productivity below the threshold of commercial forest land of 20 cubic feet of wood production per acre per year or cause noncommercial forest land to be converted to nonforest land.

(b) Nonsuitable (FWNW)

Water tolerant tree and understory species grow on these sites. Commercial conifer survival and productivity are severely limited due to excessive groundwater. Soils typically have dark colored surface horizons and low chroma mottles at or near the surface. Groundwater is altered when a site is disturbed and results in unacceptable productivity losses and/or loss of water tolerant tree species. Forest management activities could reduce site productivity below the threshold of commercial forest land (20 cubic feet of wood produced per acre per year) or cause noncommercial forest land to be converted to nonforest land. The Elgarose Drainage has five acres of this classification type.

VI. Hydrology

A. Introduction

The Lower South Umpqua Watershed Analysis Unit (WAU) is approximately 172.5 square miles in size. Much of the land along the South Umpqua River is used for agricultural purposes. In the agricultural areas many of the tributaries to the river have been straightened or had their flow patterns altered. Most of the native vegetation has been replaced with low growing vegetation, generally grasses. Riparian areas may have deciduous trees along the stream banks.

The higher elevations are a combination of BLM-administered and private timber lands. Logging and road construction have probably affected channel complexity, water quality, and hydraulic processes in the WAU.

B. Climate

The Lower South Umpqua Watershed Analysis Unit has a Mediterranean type of climate characterized by cool, wet winters and hot, dry summers. Most of the precipitation occurs as rainfall. However, the higher elevations of the WAU could receive a significant amount snowfall.

The Roseburg weather station, which is in the WAU, was used to characterize the climate (see Table 20). Since the Roseburg weather station is near the lowest elevation in the WAU, differences in temperature and precipitation could be expected at the higher elevations of the WAU. Table 21 shows the average maximum, minimum, and mean monthly temperatures at Roseburg, Oregon (Owenby and Ezell 1992).

Table 20. Roseburg Weather Station Data Used to Characterize Precipitation in the Lower South Umpqua Watershed Analysis Unit.

Elevation (Feet)	Period of Record (Water Year)	Mean Water Year Precipitation (inches)	Mean Annual Temperature (Degrees Fahrenheit)
470	1894-1965	32.2	54.5*
420	1966-1998	33.8	54.5*

*Temperature Data is from 1932-1999.

Table 21. Average Temperatures in Degrees Fahrenheit at Roseburg, Oregon from 1961 to 1990.

Month	Maximum	Minimum	Mean
October	67.0	43.8	55.4
November	54.3	39.3	46.8
December	48.0	34.8	41.5
January	48.5	33.9	41.2
February	53.4	35.8	44.6
March	57.8	37.7	47.8
April	62.9	39.7	51.3
May	69.3	44.5	56.9
June	76.5	50.3	63.4
July	83.6	53.5	68.6
August	84.1	54.3	69.2
September	78.1	49.3	63.7

Chart 3 shows the range and variability of precipitation at the Roseburg weather station from 1894 to 1999. The change in mean precipitation from before and after the station moved in 1965 is also presented. The lowest amount of precipitation of 18.5 inches was recorded for water year 1977. The highest amount of precipitation of 51.5 inches was recorded for water year 1997.

Chart 4 shows the deviation from the mean of water year temperature and precipitation from 1932 to 1999 at the Roseburg weather station. Some cyclical patterns between warmer or cooler temperature patterns and drier or wetter precipitation patterns are noticeable.

C. Streamflow

There are three gaging stations located within the WAU. The South Umpqua River near Brockway and South Fork Deer Creek near Dixonville are active gaging stations run by the United States Geological Survey (USGS). The USGS also operated the Deer Creek near Roseburg gaging station, which currently is being used only as a flood warning station by Douglas County, Oregon.

Table 22 presents the historical streamflow data and peak flow probabilities for the three gaging stations located in the WAU. Periods of record too short to predict certain recurrence intervals are indicated by no data being shown in the table. The data presented in Table 22 would be useful for estimating how often

Chart 3. Comparison of Water Year Precipitation at the Roseburg, Oregon Weather Station From 1894 to 1999.

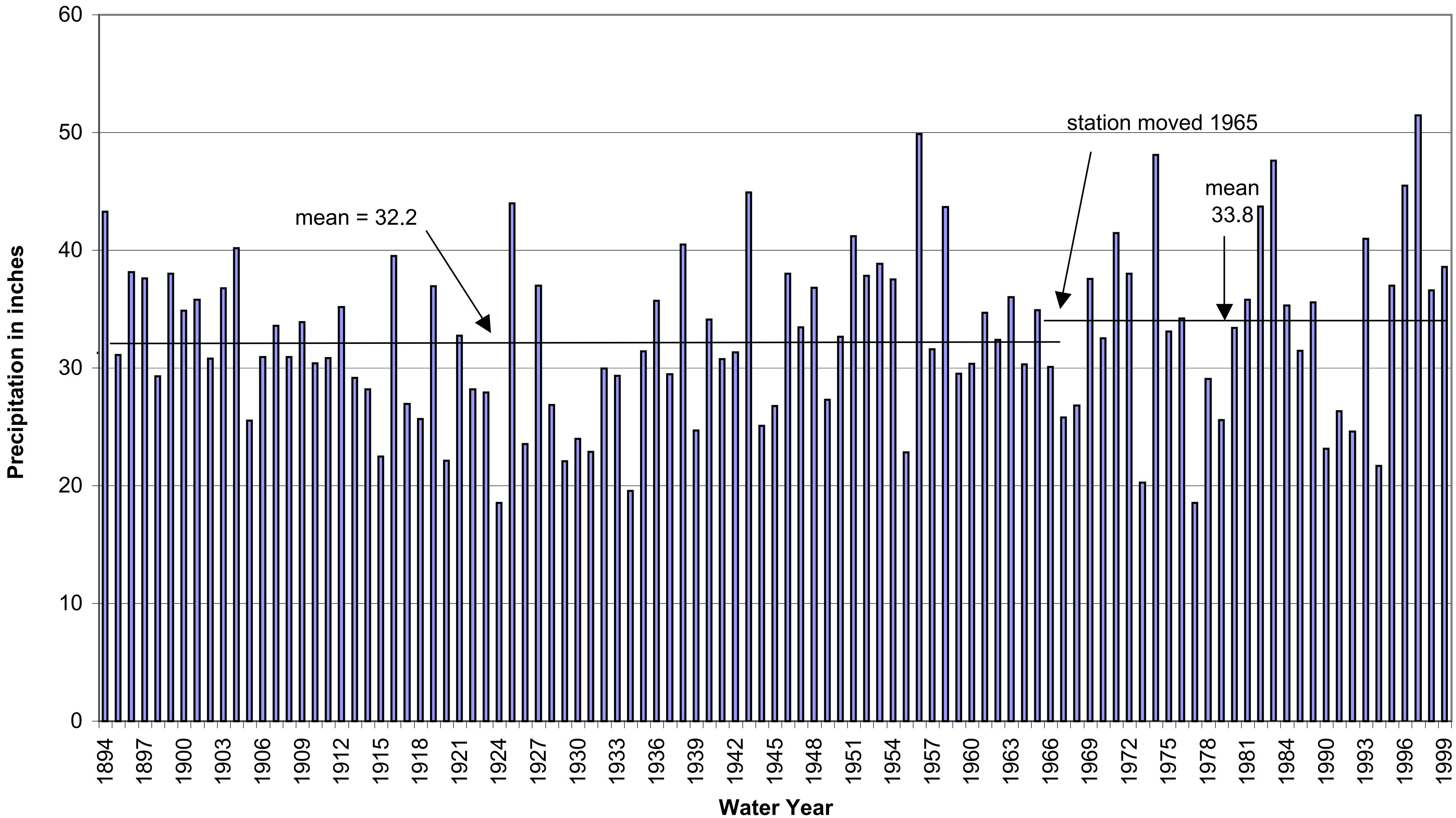
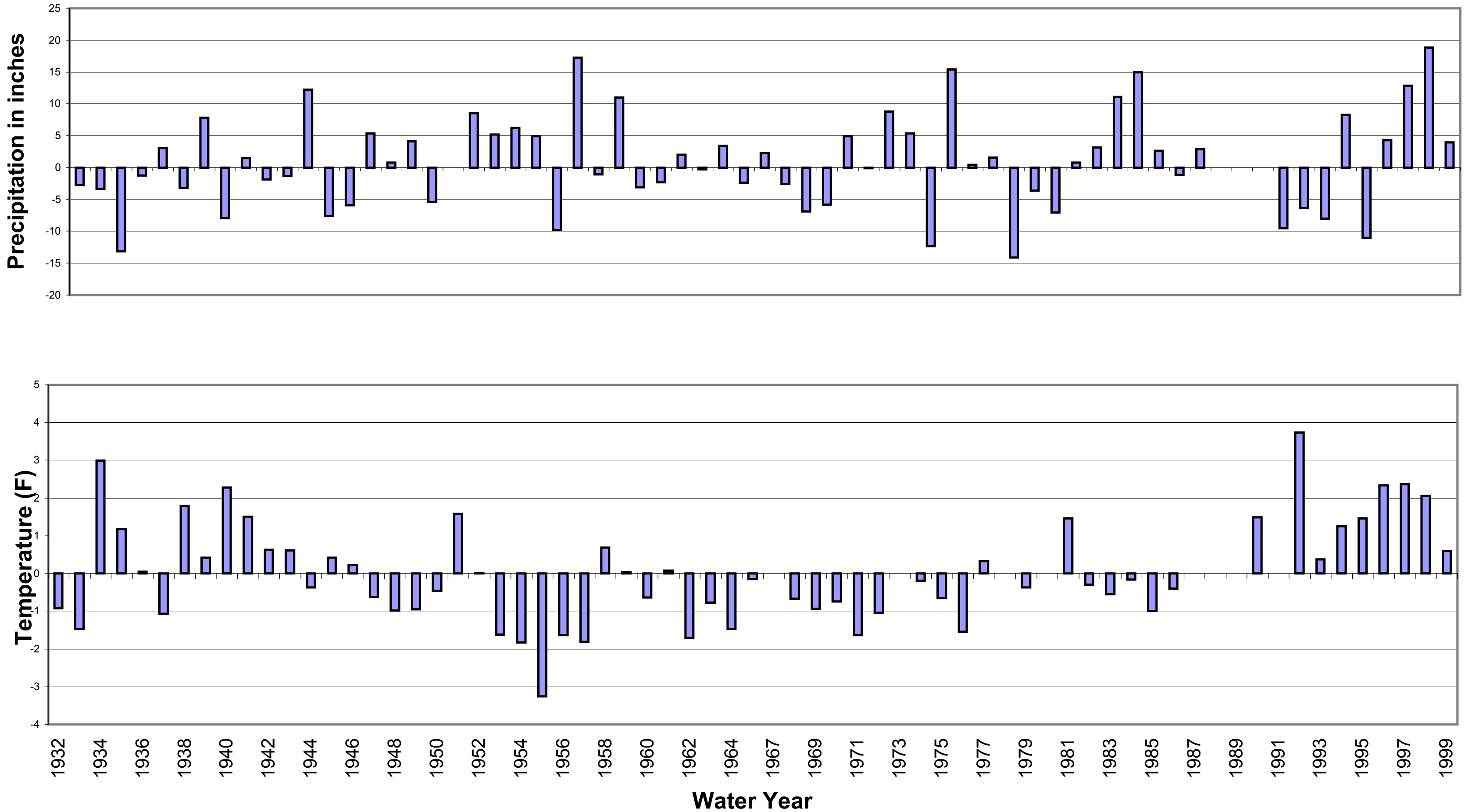


Chart 4. Annual Precipitation and Temperature Deviations From the Mean at the Roseburg, Oregon Weather Station From 1932 to 1999.



note: no precip data from 1987-1989, no temp data for 1973, 1978, 1980, 1987-1989
note: mean temperature = 54.5 F, mean precipitation = 33.8 inches

a peak flow may occur. Flow magnitude is dependent on the size of the drainage area. The recurrence interval (sometimes called the return period) is used more often than the annual exceedence probability. An example would be an instantaneous peak flow exceeding 9,110 cubic feet per second (cfs) at the Deer Creek near Roseburg gage would have a one percent probability of occurring in any year, or a recurrence interval of one in 100, which is called the 100-year flood.

Table 22. Magnitude and Probability of Instantaneous Peak Flow for the South Umpqua River near Brockway, Deer Creek near Roseburg, and South Fork Deer Creek near Dixonville Gaging Stations.

Gaging Station	Drainage Area (square miles)	Recurrence Interval (years)	1.25	2	5	10	25	50	100
		Annual Exceedence Probability	80%	50%	20%	10%	4%	2%	1%
South Umpqua River near Brockway Discharge (cfs)	1,670		31,100 ND	48,300 49,400*	71,110 76,100*	85,200 94,400*	101,800 118,000*	113,300 135,000*	124,000 153,000*
Deer Creek near Roseburg Discharge (cfs)	53.2		2,950 ND	3,900 4,000*	5,170 5,390*	6,000 6,300*	7,030 7,430*	ND 8,270*	ND 9,110*
South Fork Deer Creek near Dixonville Discharge (cfs)	15.2		252^	392^	1,720^	1,910^	ND	ND	ND

Data from Wellman et al. 1993
* Data from Harris et al. 1979
^ Recurrence interval determined by Roseburg District BLM using USGS data.
ND = No Data

The USGS method of estimating floods could be used to estimate the magnitude and frequency of floods for ungaged streams in the WAU. The information could be used to determine the size of culvert to install on a particular stream. The area of lakes and ponds, precipitation intensity, and drainage area are information needed to be able to use the USGS method (Harris et al. 1979). The area of lakes and ponds may be insignificant in some of the drainages in the WAU. Precipitation intensity is the maximum 24-hour rainfall having a recurrence interval of two years. Precipitation intensity can be determined using a map prepared by the National Oceanic and Atmospheric Administration (USDC 1973). The estimated precipitation intensity ranges from 2.5 inches in the lower elevations to 3.5 inches in the higher elevations of the WAU.

Stream flows may be affected by human water withdrawals, mainly in the summer when stream flows are low. Most streams in the higher elevations are not impacted by irrigation withdrawals. However, water may be withdrawn for road maintenance and fire protection. In 1996 more than 69 cubic feet per second (cfs) of streamflow was appropriated for water rights within the WAU. The water is used for a variety of purposes including municipal water sources, domestic water use, industrial water use, irrigation, livestock water use, fire protection, recreation, wildlife, and fish rearing. The restrictions on these water rights are not known. Domestic water withdrawal, irrigation, agriculture, and livestock water use contribute to the lower summer flows. Water withdrawn during the summer may decrease available habitat for aquatic life and increase summer water temperatures and pH due to the decreased amount of water in the stream.

Chart 5 shows about 86 percent of the annual precipitation occurs from October through April (Owenby and Ezell 1992). Stream flow follows the precipitation pattern of large seasonal variations with higher stream flows in the winter and lower stream flows in the summer (see Chart 6). Ninety-seven percent of the annual runoff at the South Umpqua near Brockway and Deer Creek near Roseburg stream gages occurred from November through May (Moffatt et al. 1990). The difference between the time in October when the winter rains begin and when an increase in runoff begins in November is due to the time it takes the soil to become saturated and allow water to flow to the stream channels.

D. Stream Channel

There are approximately 458 miles of streams in the Lower South Umpqua WAU. Drainage density is about 2.66 miles of streams per square mile (see Table 23).

The Rosgen stream classification method may be used to characterize channel morphology for stream reaches in the WAU. The Rosgen Classification can be used as an indicator to determine stability, sensitivity to disturbance, recovery potential, sediment supply, streambank erosion potential, and influence of vegetation on the stream channel (Rosgen 1994). Streams may be divided into sediment source areas, transport areas, and depositional areas based on the slope or gradient of the stream channel. Stream channels tend to be steeper in the upper reaches and flatter in the lower reaches. High gradient streams (A and Aa+ type streams) are source areas for debris torrents. Medium gradient streams (B type streams) are transport areas that do not change significantly with time. Sediments pass through transport areas rather than being deposited. Low gradient streams (C or F type streams) are the stream type most likely to change due to deposition and erosion of sediments. Low gradient streams provide the best quality fish habitat because they have meanders, under cut banks, deep pools, large woody debris (LWD), and gravel tends to accumulate in these reaches. Many low gradient stream channels in the WAU have been eroded down to bedrock, probably due to increased peak flows as a result of timber harvesting, road construction, channel downcutting due to over grazing on streambanks, and the lack of LWD due to stream cleaning practices.

Chart 5. Average Monthly Precipitation at Roseburg, Oregon From 1961 to 1990.

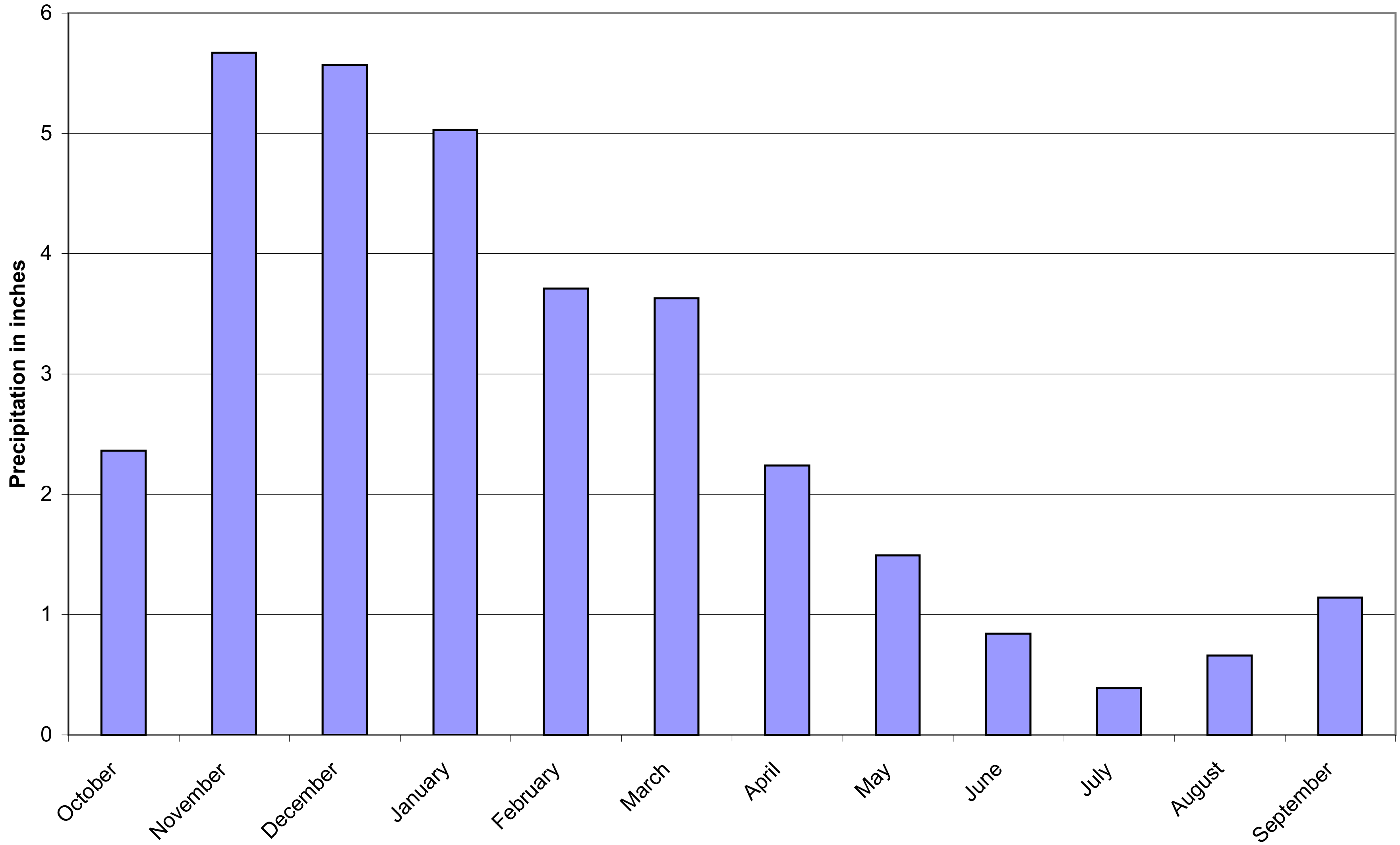


**Chart 6. South Umpqua near Brockway and Deer Creek near Roseburg
Average Annual Runoff Percentage**

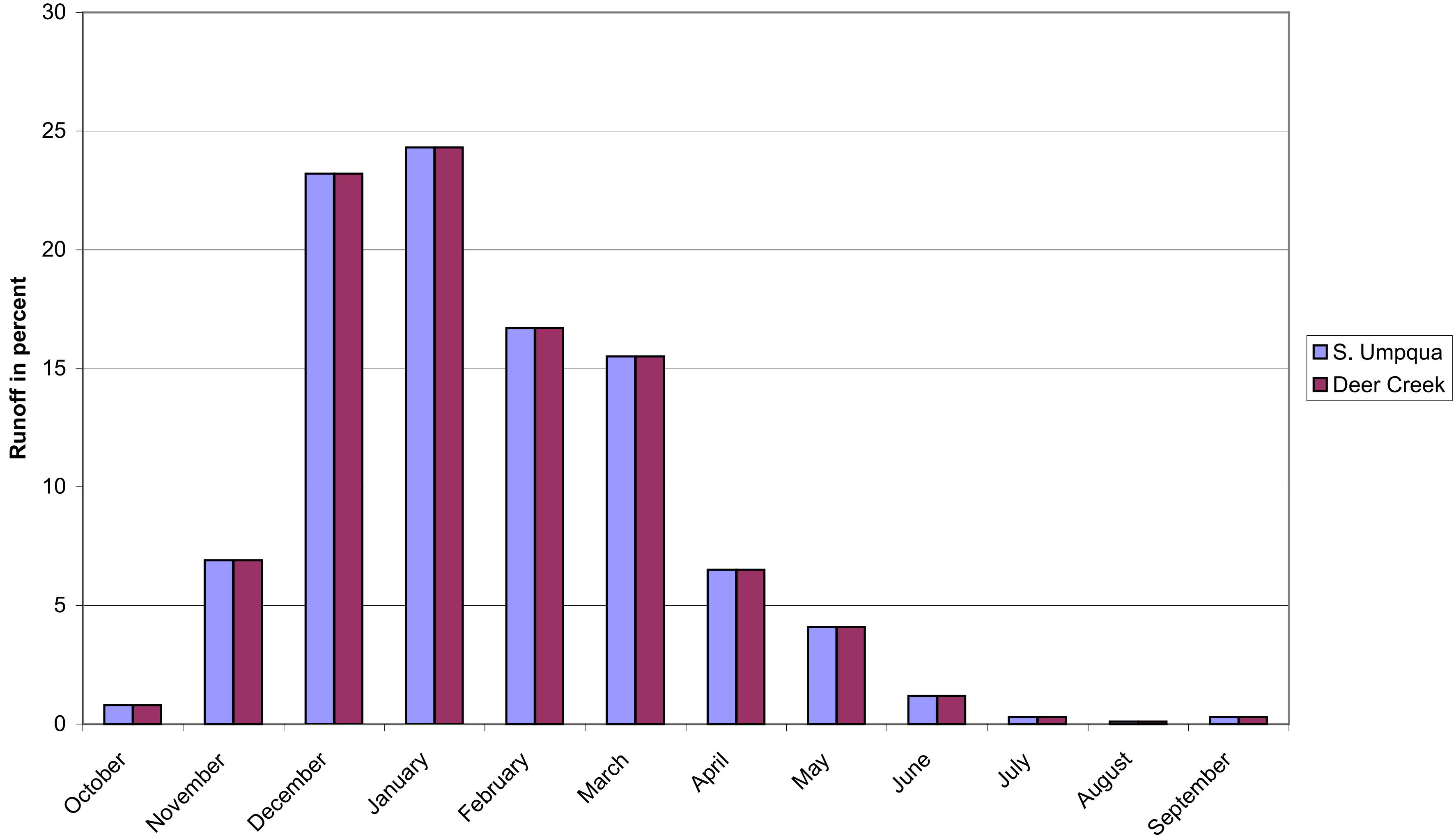


Table 23. Miles of Roads and Streams, Number of Stream Crossings, and Densities in the Lower South Umpqua WAU.

Drainage Name Subwatershed Name	Area (Acres)	Area (Square Miles)	Miles of Roads	Road Density (Miles per Square Mile)	Miles of Streams	Stream Density (Miles per Square Mile)	Number of Stream Crossings	Stream Crossings per Stream Mile
Brushy Butte	4,511	7.05	33.36	4.73	31.09	4.41	64	2.06
North Fork Deer Creek	9,883	15.44	59.31	3.84	58.96	3.82	105	1.78
South Fork Deer Creek	7,569	11.83	60.34	5.10	49.30	4.17	108	2.19
Deer Creek Subwatershed	21,963	34.32	153.01	4.46	139.35	4.06	277	1.99
Blackhole	70,973	110.90	674.86	6.09	247.65	2.23	486	1.96
Roseburg West Subwatershed	70,973	110.90	674.86	6.09	247.65	2.23	486	1.96
Callahan Creek	5,415	8.46	44.16	5.22	21.20	2.51	38	1.79
Champagne Creek	6,052	9.46	52.93	5.60	22.78	2.41	55	2.41
Elgarose	6,016	9.40	51.35	5.46	27.49	2.92	52	1.89
Wardton Subwatershed	17,483	27.32	148.44	5.43	71.47	2.62	145	2.03
Lower South Umpqua WAU	110,419	172.53	976.31	5.66	458.47	2.66	908	1.98

Level I classification is a first look at determining stream types. The Level I characterization uses topographic maps, aerial photographs, or GIS to delineate stream types based on gradient and sinuosity (Rosgen 1996). Levels II through IV classifications require field surveys to determine priorities for restoration, potential for changes in stream morphology due to management activities, and to design restoration projects. Development of regional hydraulic geometry curves under the Level II classification can be used to predict streamflow, depth, width, and cross-sectional area of ungaged streams. Regional hydraulic geometry curves were recently developed for the South Umpqua River Basin by the Roseburg BLM District (see Appendix D).

Regional curves can be used to refine the initial estimates of bankfull channel dimensions for ungaged streams, if they represent the hydro-physiographic province (Rosgen 1996). Correct and reliable interpretations of the interrelationships between dimension, pattern, profile, and streamflow depends upon correctly identifying bankfull stage or elevation and the related discharge. The regional curves can also be used to determine the feasibility of restoration projects, what structures needed to enhance and promote channel stability, and the size of culverts or bridges to install. Regional curves are required for developing and operating the Shadow Model, which may be used to develop a Water Quality Management Plan (WQMP) and establishing Total Maximum Daily Loads (TMDLs).

Bankfull discharge transports most of the available sediment over time (Wolman and Miller 1960). Bankfull discharge influences channel formation and maintenance the most (Leopold et al. 1964). Bankfull flows provide the annual maintenance of transporting sediment supplied from upstream sources, forming and removing bars, and forming or changing bends that create the average morphologic characteristics of the channel (Dunne and Leopold 1978).

E. Roads

Timber harvesting and road building can potentially contribute to increased peak flows above normal rates, add sediment to the stream, increase the risk of landslides, increase stream temperature, and change stream channel morphology (Beschta 1978, Harr and McCorison 1979, Jones and Grant 1996, and Wemple et al. 1996). Although many of these impacts can be mitigated or lessened with improved management techniques, past practices would continue having some impacts on the hydrology in the WAU.

Roads have the potential to increase peak flows by delivering water to the stream channel faster than in a non-roaded landscape. Roads can also increase the stream drainage network by routing water into culverts, which if not properly located can cause gullying, effectively acting as another stream channel (Wemple et al. 1996). Increased sedimentation from roads can occur if culverts drain onto unstable or erosive slopes or if too few culverts are placed along the road, eroding in the ditchline.

Areas with the most stream crossings and subsequently the most culverts would have the greatest risk of culverts failing or becoming blocked during storm events. Blocked or failed culverts can increased erosion, road failures, or debris slides. Culverts can influence the stream channel by limiting stream meandering, changing stream gradient, limiting bedload movement, and increasing sediment from failures. A limited number of culverts in the WAU have been inspected or maintained. The Resource Management Plan (RMP) states new and replacement culverts should accommodate a 100 year flood event.

Road densities in the WAU range from 3.84 to 6.09 miles per square mile (see Table 23). The average road density in the WAU is 5.66 miles per square mile. There are approximately 908 stream crossings in the WAU. Approximately 48 of the stream crossings are on BLM-administered land (see Table 24). Approximately 47 of the 48 stream crossings on BLM-administered land are in the Deer Creek Subwatershed. Stream crossing densities range from 1.78 stream crossings per stream mile in the North Fork Deer Creek Drainage to 2.41 stream crossings per stream mile in the Champagne Creek Drainage. The average number of stream crossings per stream mile in the WAU is 1.98.

Table 25 shows the number of miles and densities of roads within Riparian Reserves and 100 feet of streams on BLM-administered land. Most of the roads on BLM-administered lands within Riparian Reserves occur in the Deer Creek Subwatershed. Of the 5.77 miles of roads within Riparian Reserves in the WAU, 3.22 miles are within 100 feet of a stream. Roads within 100 feet of a stream are more likely to add sediment to the stream, since the limited amount of vegetation between the road and stream cannot capture the sediment before it reaches the stream. Generally, buffers less than 100 feet were not adequate to prevent sediment from reaching the stream channel (Clinnick 1985, Erman et al. 1977, Erman and Mahoney 1983, Packer 1967, and Trimble and Sartz 1957). The buffer width may need to be increased depending on topography, soils, or vegetative conditions. However, buffers are not effective at controlling sediment flowing in channels. Water flowing in a channel needs to be diverted where it can be filtered before reaching the stream.

Table 24. Miles of Roads and Streams, Number of Stream Crossings, and Densities on BLM Administered Lands in the Lower South Umpqua WAU.

Drainage Name Subwatershed Name	Area (Acres)	Area (Square Miles)	Miles of Roads	Road Density (Miles per Square Mile)	Miles of Streams	Stream Density (Miles per Square Mile)	Number of Stream Crossings	Stream Crossings per Stream Mile
Brushy Butte	1,306	2.04	8.87	4.35	8.46	4.15	18	2.13
North Fork Deer Creek	653	1.02	4.97	4.87	4.55	4.46	10	2.20
South Fork Deer Creek	1,176	1.84	9.99	5.44	7.65	4.16	19	2.48
Deer Creek Subwatershed	3,135	4.90	23.83	4.86	20.66	4.22	47	2.27
Blackhole	618	0.97	3.83	3.97	1.55	1.61	1	0.65
Roseburg West Subwatershed	618	0.97	3.83	3.97	1.55	1.61	1	0.65
Callahan Creek	0	0	0	0	0	0	0	0
Champagne Creek	0	0	0	0	0	0	0	0
Elgarose	402	0.63	1.76	2.80	2.08	3.31	0	0
Wardton Subwatershed	402	0.63	1.76	2.80	2.08	3.31	0	0
Lower South Umpqua WAU	4,155	6.49	29.42	4.53	24.29	3.74	48	1.98

Table 25. Miles of Roads and Road Densities Within Riparian Reserves and Within 100 Feet of a Stream on BLM Administered Land in the Lower South Umpqua WAU.

	Riparian Reserves				Within 100 Feet of a Stream			
Drainage Name Subwatershed Name	Area (Acres)	Area (Square Miles)	Miles of Roads	Road Density (Miles per Square Mile)	Area (Acres)	Area (Square Miles)	Miles of Roads	Road Density (Miles per Square Mile)
Brushy Butte	348	0.54	2.08	3.83	201	0.31	1.21	3.85
North Fork Deer Creek	194	0.30	1.11	3.66	109	0.17	0.72	4.23
South Fork Deer Creek	313	0.49	2.49	5.09	181	0.28	1.23	4.35
Deer Creek Subwatershed	855	1.34	5.68	4.25	490	0.77	3.16	4.13
Blackhole	67	0.10	0.09	0.86	40	0.06	0.06	0.96
Roseburg West Subwatershed	67	0.10	0.09	0.86	40	0.06	0.06	0.96
Callahan Creek	0	0	0	0	0	0	0	0
Champagne Creek	0	0	0	0	0	0	0	0
Elgarose	103	0.16	0	0	56	0.09	0	0
Wardton Subwatershed	103	0.16	0	0	56	0.09	0	0
Lower South Umpqua WAU	1,024	1.60	5.77	3.61	586	0.92	3.22	3.52

Many roads in the WAU are in need of maintenance. Maintenance needing to be performed may include removing slides blocking ditchlines or culverts or installing additional cross drain culverts and/or waterbars on the roads to reduce the amount of runoff entering the streams. Installing cross drains would disperse the water flowing in the ditchline keeping it from flowing into the stream. This would decrease the potential for larger peak flows, increase the amount of subsurface flow, and provide more sediment filtration.

Maintenance needs may also include grading roads to reduce the amount of water flowing in ruts on the road. Water in a rut may flow past several culverts carrying sediment from the road surface into a stream. Mulching bare cutbanks and fill slopes and limiting access to unsurfaced roads in the wet season could decrease surface erosion and minimize the amount of sediment flowing into streams from roads.

The Transportation Management Objectives (TMOs) identifies roads which could be decommissioned or improved to decrease the impact of roads in the WAU. Other roads not identified in the TMOs (such as jeep roads) on BLM-administered lands may need to be maintained, improved, or decommissioned.

F. Peak Flows

Timber harvesting and road building within the Transient Snow Zone (TSZ) can result in increased peak flows during warm rain-on-snow events. The Transient Snow Zone (TSZ) is defined as land between 2,000 and 5,000 feet in elevation. Harr and Coffin (1992) noted that snow stored under a forest canopy of at least 70 percent crown closure was less susceptible to rapid snowmelt than snow in openings. The rapid snowmelt may allow a large amount of water flow into streams. Increased peak flows following timber harvesting in the TSZ could lead to an increase in landslides and erosion (Harr 1981).

Table 26 shows the percentage of acres in the TSZ by Drainage and Subwatershed. Mostly of the WAU is below 2,000 feet in elevation. About six percent of the WAU is above 2,000 feet in elevation.

Table 26. Number of Acres and Percent of Drainage in the Transient Snow Zone in the Lower South Umpqua WAU.

Drainage Name **Subwatershed Name**	BLM Acres in Transient Snow Zone	Total Acres in Transient Snow Zone	Percent of Entire Drainage in the Transient Snow Zone
Brushy Butte	733	1,242	28
North Fork Deer Creek	396	1,211	12
South Fork Deer Creek	921	1,909	25
Deer Creek Subwatershed	2,050	4,362	20
Blackhole	221	1,328	2
Roseburg West Subwatershed	221	1,328	2
Callahan Creek	0	337	6
Champagne Creek	0	0	0
Elgarose	171	333	6
Wardton Subwatershed	171	670	4
Lower South Umpqua WAU	2,442	6,360	6

Drainages with high road densities, high stream crossing densities, a large portion in the TSZ, and a large percentage harvested within the last 30 years may be susceptible to increased peak flows. During rain-on-snow events, water is routed to the streams faster because snow accumulation is greater in recently harvested units. Management activities, such as regeneration harvests and road building, may magnify the effects of increased peak flows in Drainages with these conditions. Table 27 shows the amount of forested land less than 30 years old in each Drainage.

Table 27. Acres and Percentages of Forested Land Less Than 30 Years Old by Drainage in the Lower South Umpqua WAU.

Drainage	Total Forested BLM Acres	Percent of Total Forested BLM Acres Less Than 30 Years Old	Total Forested Private Acres	Percent of Total Forested Private Acres Less Than 30 Years Old	Total Forested Acres	Percent of Total Forested Acres Less Than 30 Years Old
Blackhole	534	29	27,976	17	28,510	17
Brushy Butte	1,296	42	2,415	20	3,711	28
Callahan Creek	0	0	4,020	11	4,020	11
Champagne Creek	0	0	3,007	7	3,007	7
Elgarose	376	7	3,088	8	3,464	7
North Fork Deer Creek	641	29	4,530	6	5,171	9
South Fork Deer Creek	1,168	39	2,908	15	4,076	22

Roads have been found to extend the stream network 60 percent over winter base flow stream lengths and 40 percent over storm event stream lengths (Wemple 1994). Road densities were 1.6 miles per square mile in Wemple's study area. Road densities in the Lower South Umpqua WAU average 5.66 miles per square mile (see Table 23). However, road densities may be higher since all roads may not be on GIS. Roads may increase winter peak flows in streams within the WAU. The majority of roads within the WAU were constructed with ditches and/or insloped road surfaces designed to carry water off of the road surface. Once the water is in the ditch, much of it may reach the stream faster than in an unroaded area. In fact, some ditchlines effectively function as stream channels extending the actual length of flowing streams during rain storms. Increased drainage density due to road construction may increase peak flows and mean annual floods. Drainages with fewer streams per square mile experience higher winter peak flows as a result of roads than drainages with a lot of streams. Fewer streams to carry the rapid runoff increases streamflow, potentially leading to down cutting, stream bank failures, stream bed scouring, and mass wasting where streams undercut adjacent slopes. The dominant factor affecting peak flow in smaller drainages is how quickly the water gets to the stream channel. Land management and urban development activities may lead to increased surface runoff.

Hydrologists on the Umpqua National Forest developed the Hydrologic Recovery Procedure (HRP) to evaluate the cumulative effects of timber harvesting in the Transient Snow Zone on streamflow in the Umpqua River Basin (USDA 1990). The Lower South Umpqua WAU is characterized as having a rain dominated precipitation regime, since most of the WAU is below 2,000 feet in elevation. However, peak flows occurring in some of the Drainages could be affected by rain-on-snow events. Increased peak flows during a rain-on-snow event may occur if a Drainage is less than 75 percent hydrologically recovered, when determined by using the Hydrologic Recovery Procedure. About six percent of the WAU is in the TSZ. Brushy Butte is the only Drainage with more than 25 percent in the TSZ. The HRP would always consider the other Drainages as at least 75 percent recovered. The HRP assumes the area below 2,000 feet in elevation is 100 percent recovered. Therefore, the HRP was not calculated for this WAU.

G. Water Quality

The Federal Clean Water Act of 1972, Section 303(d), directs each state to identify streams which do not meet water quality standards. The Oregon Department of Environmental Quality (DEQ) monitors water quality conditions of the streams in Oregon. The BLM has not collected water quality data in the Lower South Umpqua WAU.

The Oregon DEQ water quality parameters and their affected beneficial uses are listed in Table 28. The criteria used to list a stream as water quality limited are based on the parameters in Listing Criteria for Oregon's 1998 303(d) List of Water Quality Limited Water Bodies (Oregon Department of Environmental Quality 1998).

Deer Creek and the South Umpqua River were on the 1998 Oregon 303(d) list (Oregon Department of Environmental Quality 1998). Deer Creek was listed from the mouth to the headwaters due to bacteria, dissolved oxygen, habitat modification, and temperature. The South Umpqua River, including the portion of the river in the WAU, was listed due to toxics, flow modification, aquatic weeds or algae, bacteria, biological criteria, dissolved oxygen, nutrients, pH, and temperature.

1. Stream Temperature

Stream temperature is one of the most important water quality parameters monitored in the WAU. Stream temperature affects resident fish, aquatic life, and salmonid fish spawning and rearing. Currently, streams with salmonids meet the Oregon DEQ water quality stream temperature criteria when maintained at or below 64 degrees Fahrenheit (17.8 degrees Celsius) for the seven-day moving average daily maximum temperature.

Table 28. Water Quality Parameters and Beneficial Uses.

Water Quality Parameter	Beneficial Uses Affected
Aquatic Weeds or Algae	Water Contact Recreation, Aesthetics, Fishing
Bacteria (E. coli) or Fecal Coliform	Water Contact Recreation
Biological criteria	Resident Fish and Aquatic Life
Chlorophyll a	Water Contact Recreation, Aesthetics, Fishing, Water Supply, Livestock Watering
Dissolved Oxygen	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Habitat Modification	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Flow Modification	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Nutrients	Aesthetics or Use Identified Under Related Parameters
pH	Resident Fish and Aquatic Life, Water Contact Recreation
Sedimentation	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Temperature	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Total Dissolved Gas	Resident Fish and Aquatic Life
Toxics	Resident Fish and Aquatic Life, Drinking Water
Turbidity	Resident Fish and Aquatic Life, Water Supply, Aesthetics

2. pH

The pH is managed to protect recognized beneficial uses. The pH standard set by the Oregon DEQ for the Umpqua River Basin is 6.5 to 8.5 (Oregon Department of Environmental Quality 1994). Levels above or below the pH standard have adverse effects on some life cycle stages of certain fish and aquatic macroinvertebrates. MacDonald et al. (1990) found that pH levels less than 6.5 and greater than 9 can have adverse affects on fish and aquatic insects. However, non-lethal effects of suboptimum pH levels on fish are not known.

3. Dissolved Oxygen

Dissolved oxygen (DO) is required for resident fish and aquatic organism survival and salmonid spawning and rearing. The Oregon DEQ set minimum DO at 6.5 mg/l for cool-water aquatic resources, which became effective July 1, 1996. The DEQ standards require greater than ten percent of the samples must be less than the minimum DO standard with at least two samples collected per season to meet the water quality limited criteria. The minimum DO standards for salmonid spawning streams were set at 11 mg/l, except where barometric pressure, altitude, and naturally occurring temperatures preclude attainment of the standard, then DO levels should not be less than 95 percent saturation. The minimum DO standards for cold water aquatic resources were set at 8 mg/l, unless the same conditions as mentioned for salmonid spawning streams are present, then the DO levels should not be less than 90 percent saturation.

4. Turbidity and Sedimentation

Turbidity is a function of suspended sediments and algal growth in a stream. Turbidity varies naturally from stream to stream depending upon geology, slope stability, rainfall, and temperature. No more than a ten percent cumulative increase in stream turbidities is allowed by the DEQ water quality standards, as measured relative to a control point upstream of the turbidity causing activity. High turbidity levels can impact salmonid feeding and fish growth (MacDonald et al. 1990). Turbidity can impact drinking water, recreational, and aesthetic uses of water. Turbidity reduces the depth sunlight penetrates, altering the rate of photosynthesis and impairing a fish’s ability to capture food. Turbidity increases with, but not as fast as, suspended sediment concentrations.

Roads have the potential to affect the sediment regime. Erosional effects can occur when culverts become plugged or cannot handle peak flows, diverting streams out of their original channel, flowing down the road and entering another stream channel. Road surface erosion varies greatly with the type and amount of traffic, season of use, and the type and quality of road surfacing material (Reid and Dunne 1984). The types of road-related surface erosion were not quantified for this watershed analysis. The quantity of sediment associated with mass wasting and potential stream crossing failures needs to be evaluated.

Rosgen has proposed methods for evaluating bank erosion and sedimentation. The methods include prediction and verification of bank erosion and tons of sediment delivered to the stream from the banks. With these data it may be possible to develop regional sediment curves, evaluate stability of stream channels and impacts of management actions on stream channels, and design stream restoration projects that consider the natural geomorphology of the stream.

5. Trace Metals

Trace metals should not be introduced into waters of the state in amounts, concentrations, or combinations above natural background levels, which may be harmful, may chemically change to harmful forms in the environment, or may accumulate in sediments or bioaccumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare, aquatic life, wildlife, or other designated beneficial uses. Trace metals should not exceed the water quality criteria established for the various metals by the Environmental Protection Agency (EPA) (Environmental Protection Agency 1986). Trace metal data were not collected in the WAU. Collecting trace metal data is probably not necessary because heavy metal outcrops do not occur in the WAU and mining activity has probably been limited to placer mining, if any mining activity occurred at all.

6. Nitrogen

Forest fertilization can impact water quality by increasing nitrogen levels in streams. Nitrogen in streams can lead to an increase in primary productivity, particularly algal blooms. The accumulation of algae in streams may affect pH. Aquatic organisms release carbon dioxide at night causing the stream pH to decrease. During the day aquatic organisms use carbon dioxide and hydrogen during photosynthesis causing the stream pH to increase. Aquatic organism respiration can lead to large changes in pH between night and day. Studies have measured less than 0.5 percent of the total nitrogen applied reached streams with adequate buffers, whereas two to three percent of the applied nitrogen was measured in streams with inadequate or no buffers (Moore 1975).

H. Groundwater

Groundwater in the northwestern portion of the WAU is chemically diverse in character (Robison and Collins 1978 and Robison 1974). There is no definite pattern in chemical character or distribution of the types of water. Waters with high concentrations of dissolved solids are more likely to be found near the contacts of the basalt members and the sandstone and siltstone member of the Umpqua Formation. The alluvium along the South Umpqua River and major tributaries to the South Umpqua River is not saturated everywhere and generally not thick enough to serve as an aquifer. Well water may become polluted if shallow wells are constructed in the alluvium (Robison 1974). Discharge rates from wells in the WAU ranged from less than one gallon per minute (gpm) to over 40 gallons per minute. Discharge rates from the majority of the wells was less than 10 gpm. Average water temperature reported by drillers was about 54 degrees Fahrenheit, about the same as the mean annual air temperature at the Roseburg weather station (54.5 degrees Fahrenheit).

I. Interpretation

Many Drainages in the WAU have been impacted by human activities. Agricultural uses can have negative impacts on streams. Removing water for irrigation and riparian vegetation can lead to decreased flows and increased temperatures in the summer. Water quality can be negatively impacted by fertilizers increasing nutrients and livestock on hillslopes and in riparian areas causing increased sediment in streams.

Urbanization in the WAU has compacted the ground and made the surface impermeable. The city of Roseburg is located in the Roseburg West Subwatershed. Table 23 shows the lowest stream density is in the Roseburg West Subwatershed. The low stream density may be due to the lower portion of the watershed having fewer streams than the headwaters but also to the land being developed for human uses. Urbanization can lead to straightening or channelizing streams and reducing stream density.

Urbanization may also decrease the infiltration rate. Studies have documented the effects of road construction and timber harvesting on stream channels and the hydrology of a watershed. Urbanization may route water to the streams faster causing increases in peak flows. This means less water would be stored as groundwater to be released in the summer for supporting fish and other aquatic organisms. The increased peak flows may also lead to more flooding than in an undisturbed watershed.

The Riparian Reserve age class distribution and the Oregon Department of Fish and Wildlife (ODFW) stream surveys indicate the stream channels are less complex, the substrate has been degraded, and fish habitat is poor in some areas of the WAU. Table C-1 in Appendix C shows the percentage of Riparian Reserves consisting of stands at least 80 years old. Removing Large Woody Debris (LWD) from the stream channels and harvesting vegetation along many streams has reduced the amount of LWD available for input into streams. Timber harvesting and road construction in and adjacent to riparian areas have led to higher stream temperatures within the WAU. The Riparian Reserves would prevent increases in stream temperatures due to timber harvesting activities on BLM-administered land.

Many roads within the WAU have not been maintained on a regular schedule. The lack of routine road maintenance may lead to increased sedimentation from the road surfaces, landslides from road failures, and an increased risk of culvert problems.

Rosgen stream surveys would be useful to classify stream types, characterize stream channel morphology, and identify potential stream restoration sites. Regional curves developed by the Roseburg BLM District could be used to predict streamflow, depth, width, and cross-sectional area of ungaged streams. This information would be useful for analyzing potential changes in stream morphology due to management activities, as well as designing restoration projects.

Riparian areas would recover naturally over time. Large Woody Debris could be placed in stream channels to increase habitat complexity and aid in the recovery of areas impacted by timber harvesting and road construction. Thinning in Riparian Reserves would allow trees adjacent to the stream channels to grow and provide natural recruitment of LWD faster than without management.

VII. Species and Habitats

A. Fisheries

1. Historic Fish Use in the South Umpqua River Basin

The South Umpqua River historically supported healthy populations of resident and anadromous salmonid fish. A survey conducted by the Umpqua National Forest in 1937 reported that salmon, steelhead, and cutthroat trout were abundant throughout many reaches of the South Umpqua River and its tributaries (Roth 1937). Excellent fishing opportunities for resident trout and anadromous salmon and trout historically existed within the South Umpqua River (Roth 1937). The historical condition of the riparian zone along the upper reaches of the South Umpqua River favored conditions typical of old-growth forests found in the Pacific Northwest. Roth noted the shade component that existed along the surveyed stream reaches. The majority of the stream reaches surveyed were "arboreal" in nature, meaning "tall timber along the banks, shading most of the stream" (Roth 1937). The river and its tributaries were well shaded by the canopy closure associated with mature trees. Streambanks were provided protection by the massive root systems of these trees.

Since 1937, many changes have occurred within the South Umpqua River Basin and in the stream reaches surveyed by Roth. A comparative study conducted by the Umpqua National Forest during summer low-flows between 1989 and 1993 surveyed the same stream reaches as in the 1937 report. The results of the study show that 22 of the 31 surveyed stream segments were significantly different than in 1937. Nineteen stream reaches were significantly wider while the remaining three stream reaches were significantly narrower. Of the eight streams surveyed within designated wilderness areas, only one stream channel increased in width since 1937. Thirteen of the 14 stream reaches located in areas where timber harvesting occurred were significantly wider than in 1937.

The stream widening may have resulted from increased peak flows. Peak flows may occur after the removal of vegetation (tree canopy) and increases in compacted area within a watershed, especially within the Transient Snow Zone (Meehan 1991). Peak flows can introduce sediment into the channel from upslope and upstream and can also simplify the channel by rearranging instream structure. Excessive sediment delivery to streams usually changes stream channel characteristics and configuration. These stream channel changes normally result in decreasing the depth and the number of pool habitats and reducing the space available for rearing fish (Meehan 1991).

Winter steelhead and resident rainbow trout (<u>Oncorhynchus</u> <u>mykiss</u>), fall and spring chinook salmon (<u>Oncorhynchus</u> <u>tshawytscha</u>), coho salmon (<u>Oncorhynchus</u> <u>kisutch</u>), and sea-run and resident cutthroat trout (<u>Oncorhynchus</u> <u>clarki</u>) have been documented using the Lower South Umpqua WAU (see Table E-1 in Appendix E). Over the last 150 years, salmonids have had to survive dramatic changes in the environment. Streams and rivers in the Pacific Northwest have been altered by European settlement, urban and industrial development, and land management practices. Modifications in the landscape and waters of the South Umpqua River Basin, beginning with the first settlers, have made the South Umpqua River less habitable for salmonid species (Nehlsen 1994).

Results from the most recent Umpqua National Forest study document changes in low-flow channel widths within the South Umpqua River Basin that have occurred since 1937 (Dose and Roper 1994). Land management activities (road construction and timber harvesting) may have contributed to the changes in stream channel characteristics. These changes in channel condition may have contributed to the observed decline in three of the four anadromous salmonid stocks occurring in the South Umpqua River Basin (Dose and Roper 1994).

The South Umpqua River once supported abundant populations of chinook and coho salmon, steelhead and cutthroat trout. These species survived in spite of the naturally low streamflows and warm water temperatures that occurred historically within the South Umpqua River Basin (Nehlsen 1994). Currently, salmonid populations throughout the Pacific Northwest are declining. A 1991 status report identified 214 native, naturally spawning fish stocks were vulnerable and at-risk of extinction (Nehlsen et al. 1991). According to this 1991 report, within the South Umpqua River, one salmonid stock is considered extinct, two salmonid stocks are at-risk of extinction, and two stocks were not considered at-risk.

Historically, steelhead runs in the South Umpqua River were strongest in the winter (Roth 1937). Currently, winter steelhead are considered to be the most abundant anadromous salmonid in the South Umpqua River (Nehlsen 1994). In 1937, Roth reported summer steelhead above the South Umpqua Falls. Summer steelhead are now considered to be extinct (Nehlsen et al. 1991).

Historically, the principal chinook run was in the late spring and summer (Roth 1937). Presently, spring chinook runs are considered to be depressed by the Oregon Department of Fish and Wildlife (ODFW). The spring chinook run is considered to be at high risk of extinction (Nehlsen et al. 1991). Fall chinook are considered to be healthy by ODFW (Nehlsen 1994).

Coho salmon were considered abundant in the South Umpqua River Basin in 1972 by the Oregon State Game Commission (Lauman et al. 1972). About 4,000 fish spawned in the South Umpqua River Basin with the largest number of fish (1,450) spawning within Cow Creek. Presently, coho salmon in the South Umpqua River Basin are suffering the same declines as other coastal stocks. These declines may be due to several factors, including the degradation of their habitat, the effects of extensive hatchery releases, and overfishing (Nehlsen 1994). No coho salmon were sampled in the upper reaches of the South Umpqua River Basin during the 1937 survey (Roth 1937). Coho salmon was documented to have a common presence in Jackson Creek, a major tributary to the South Umpqua River, in the summer of 1989 (Roper et al. 1994). The documentation of coho salmon using Jackson Creek suggests this species exists in the upper reaches of the South Umpqua River Basin. Coho salmon have been observed and documented to occur in the Lower South Umpqua WAU as well.

Sea-run cutthroat are assumed to be depressed from historic levels. The information provided in the 1937 Roth report noted cutthroat trout were common and/or abundant throughout the stream reaches surveyed in the upper South Umpqua River Basin. There are limited historical records on cutthroat population size in the South Umpqua River.

The assumption that sea-run cutthroat trout abundance is currently below historic levels throughout the Umpqua River Basin is based upon the information provided from the fish counting station at Winchester Dam on the North Umpqua River. Between the years of 1947 and 1957, sea-run cutthroat trout runs in the North Umpqua River averaged approximately 900 fish per year. The most number of sea-run cutthroat trout returning to the North Umpqua River within the ten year period was 1,800 fish in 1954 and the least was 450 fish in 1949. In the late 1950s, the sea-run cutthroat trout returns declined drastically.

The stocking of Alsea River cutthroat trout into the Umpqua River Basin began in 1961 and continued until the late 1970s. Introducing this genetically distinct trout stock into the Umpqua River Basin has apparently compounded the problem for the sea-run cutthroat trout native to the Umpqua River Basin. Sea-run cutthroat trout returns have been extremely low since discontinuing the hatchery releases in the late 1970s. The levels of returns resemble prehatchery release conditions of the late 1950s, with an average return of less than 100 fish per year (ODFW 1994 - overhead packet). Table 29 shows the number of sea-run cutthroat that returned to the North Umpqua River from 1992 through 1999.

Table 29. Number of Returning Adult Sea-run Cutthroat Trout at Winchester Dam on the North Umpqua River from 1992 to 1999.

Year	Number of Fish
1992-1993	0
1993-1994	29
1994-1995	1
1995-1996	79
1996-1997	75
1997-1998	91
1998-1999	159
1999-2000 (as of January 31, 2000)	93

According to the available data, the South Umpqua River appears to have supported a larger run of sea-run cutthroat trout than the North Umpqua River. In 1972, 10,000 sea-run cutthroat trout were estimated to have returned to the South Umpqua River. Sea-run cutthroat trout populations have the highest occurrence in streams occupied by and accessible to coho salmon (Lauman et al. 1972). Sea-run cutthroat trout are currently limited to the upper portion of the South Umpqua River and Cow Creek, one of the major tributaries to the South Umpqua River. Warm water temperatures, lack of over-summering pool habitats, and low flows prevent sea-run cutthroat trout from using stream reaches in the lower part of the South Umpqua River Basin (Nehlsen 1994).

2. Current Fish Status

a. Threatened and Endangered Species

The National Marine Fisheries Service (NMFS) listed the Oregon Coast coho salmon Evolutionary Significant Unit as a threatened species in 1998 under the Endangered Species Act (ESA) of 1973, as amended (Federal Register, Vol. 63, No. 153/Monday, August 10, 1998/Rules and Regulations). Critical habitat has not been designated for the Oregon Coast coho salmon.

b. Other Special Status Fish Species

The Umpqua River cutthroat trout was listed by the National Marine Fisheries Service (NMFS) as an endangered species under the Endangered Species Act (ESA) of 1973, as amended (Federal Register, Vol. 61, No. 155/ August 9, 1996/ Rules and Regulations). Critical habitat for the Umpqua River cutthroat trout was designated in 1998. The Umpqua River cutthroat trout were removed from the Federal List of Endangered and Threatened Wildlife on April 26, 2000 (Federal Register, Vol. 65, No. 81/April 26, 2000/Rules and Regulations).

The Oregon Coast steelhead trout Evolutionary Significant Unit is a candidate species for listing under the ESA (Federal Register, Vol. 63, No. 53/Thursday, March 19, 1998/Rules and Regulations). The Pacific lamprey (Lampetra tridentata) and the Umpqua chub (Oregonichthys kalawatseti) are on the United States Fish and Wildlife Service (USFWS) list as Species of Concern and are considered to be Bureau Sensitive Species by the BLM (Manual 6840). All of the Special Status fish species have been documented to occur in the South Umpqua River.

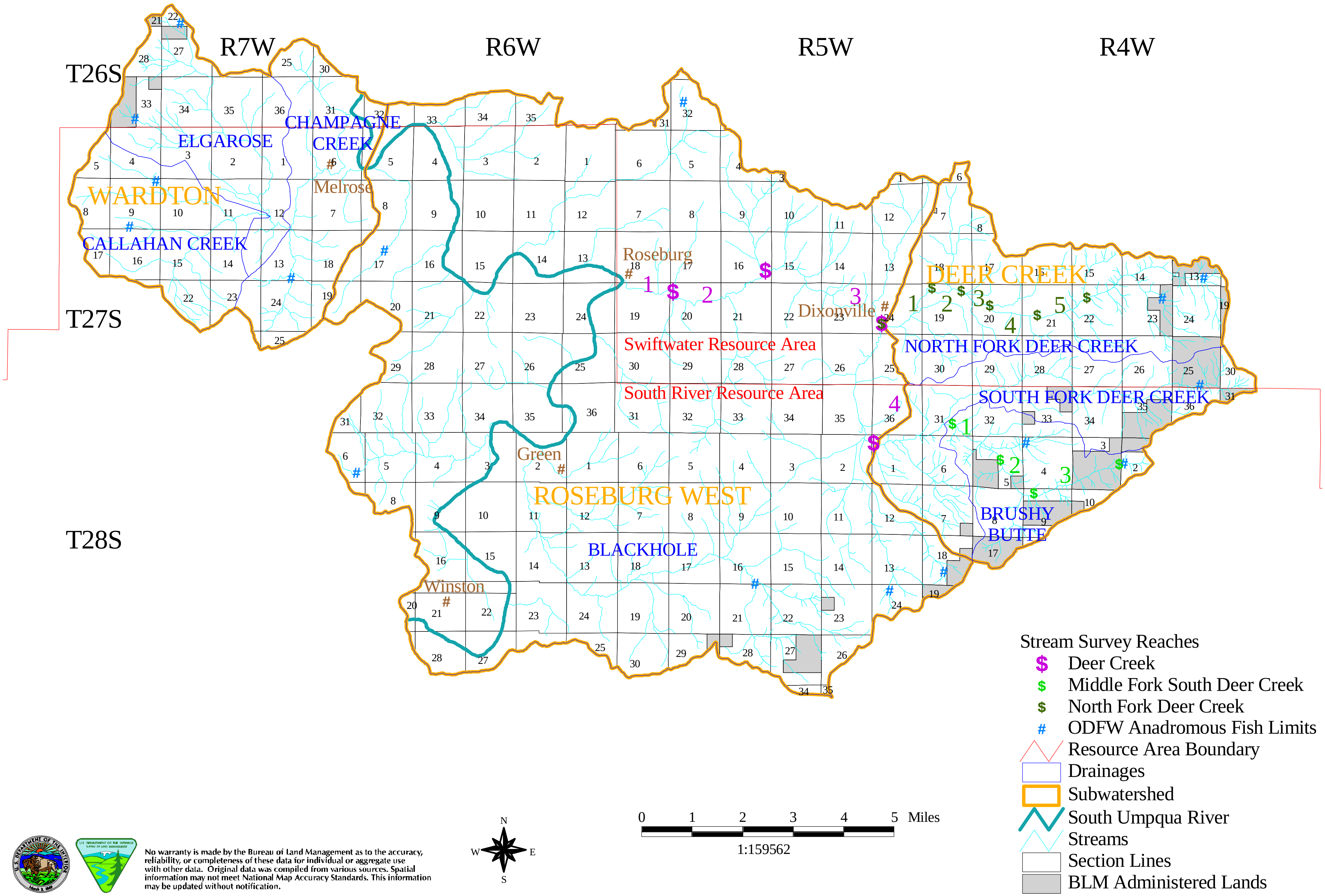
3. Current Stream Habitat Conditions

Fish distribution limits have been mapped, using GIS, for streams with documented barriers within the Lower South Umpqua WAU (see Map 20). Distribution limits of anadromous and resident fish are determined by the extent these fish are able to migrate upstream. Anadromous fish distribution limits are based upon documented or suspected historic limits of steelhead trout, sea-run cutthroat trout, or coho salmon (see Map 20). Natural waterfalls, log or debris jams, beaver dams, and road crossings are potential barriers to fish movement and migration. Fish migration barriers have not been mapped and is considered a data gap for this WAU.

Aquatic habitat inventories were completed on three streams in the WAU (see Table C-3 in Appendix C). The stream inventories covered about 18 miles of the approximately 458 total stream miles within the WAU. The inventories are used to describe the current condition of the aquatic habitat with a focus on the fish-bearing stream reaches within a watershed.

The aquatic habitat inventory is not a fish distribution or fish abundance survey. The habitat inventory is designed only to survey physical habitat features. However, fish use and distribution information was noted in the habitat inventories. The stream surveyors noted fish use by visual observation only. The habitat

Map 20. Lower South Umpqua Watershed Analysis Unit
Fish Distribution Limits and Stream Survey Reaches



condition and fish species distribution information of the streams that have not been surveyed is in the form of personal communications and observations by ODFW and BLM biologists.

Anadromous fish distribution limits were determined based on available winter steelhead distribution data provided by ODFW. When stream or fish distribution information was not available, GIS information was used to determine upstream migration fish limits (see Map 20). Based on the fish distribution information derived from GIS data, there are approximately 115 miles of fish-bearing streams in the WAU. Anadromous fish distribution was considered to include streams in the Lower South Umpqua WAU that were third order or larger in size and had less than a 15 percent gradient. The results using GIS were similar to on-the-ground verified anadromous fish distribution limits.

Resident fish distribution limits have not been determined for this WAU but are expected to be more widely distributed than anadromous fish. Resident fish distribution information in the WAU would be included in an updated watershed analysis.

The data collected through the ODFW Aquatic Habitat Inventory can be used to analyze the components that may limit the aquatic habitat and the fishery resource from reaching their optimal functioning condition. The Habitat Benchmark Rating System is a method developed by the Umpqua Basin Biological Assessment Team (BAT team) to rank aquatic habitat conditions. The BAT team consists of fisheries biologists from the Southwest Regional Office of the ODFW, Coos Bay BLM District, Roseburg BLM District, Umpqua National Forest, and Pacific Power and Light Company. The matrix designed by the BAT team was to provide a framework to easily and meaningfully categorized habitat condition. This matrix was not intended to reflect equality of the habitat condition of each stream reach but to summarize the overall condition of the surveyed reaches. The matrix consists of four rating categories Excellent, Good, Fair, and Poor (see Table C-2 in Appendix C).

Data from the ODFW Aquatic Habitat Inventories conducted in the Deer Creek Subwatershed were analyzed to determine an overall aquatic habitat rating (AHR) for each stream. How the ratings correlate with the NMFS Matrix (see Appendix C) are shown in Table 30.

Each stream reach contains different limiting factors. Limiting factors for the fishery resource may include reduced instream habitat structure, increased sedimentation, the absence of a functional riparian area, decreased water quantity or quality, or the improper placement of drainage and erosion control devices associated with the forest road network.

Table 30. Aquatic Habitat Ratings (AHR) in Comparison to the NMFS Matrix.

ODFW Aquatic Habitat Inventories	NMFS Matrix
Excellent or Good	Properly Functioning
Fair	At Risk
Poor	Not Properly Functioning

Eleven of the twelve stream reaches identified in the Aquatic Habitat Inventories were rated as being in Fair condition. One stream reach was rated as being in Poor condition. No stream reaches were rated as being in Excellent condition.

4. Interpretation

Historic vegetation data from 1900 indicates land use in the WAU was predominantly agricultural or nonforested, unlike the forested conditions along the upper reaches of the South Umpqua River. Approximately 58 percent of the WAU was characterized as in an open or nonforested condition (see Table 3). The riparian areas may have been dominated by hardwoods with a few, scattered, large conifers. Therefore, the riparian areas in the low gradient, valley floor portion of the WAU were probably not a major source for adding LWD to the streams. Large woody debris recruitment to streams may occur -- frequently (chronic) or infrequently (episodic) (Maser et al. 1988). The interval is dependant on numerous factors. It is suspected that most LWD recruitment in this WAU occurred during episodic events. Large woody debris located in the high gradient stream reaches of the WAU were probably transported downstream to the low gradient stream reaches during large flood events. The large floods would have created favorable habitat conditions for anadromous salmonids in the valley bottom streams of the WAU.

Prior to European settlement, stream habitat is assumed to have consisted of a natural range of conditions. Fish populations would have been influenced by natural events such as flooding, climate, and ocean productivity rather than by commercial and recreational fish harvesting, man-made barriers (such as hydroelectric and irrigation dams), and livestock grazing. Beginning in the mid-1800s, rivers were cleared of debris to improve navigation and floodplain forests were cleared for agriculture, timber, and fuel wood (Meehan 1991). Recent stream habitat condition surveys suggest stream debris and riparian area clearing had been conducted on the surveyed stream reaches. These land management practices have negatively impacted the fisheries resource.

Most of the fish in the WAU occur in the larger (third order or larger in size) and low gradient (less than two percent gradient) stream reaches. Anadromous fish use the lower gradient stream reaches for spawning and/or rearing. The low gradient stream reaches are also where the most of the agricultural lands are located. Livestock grazing and water withdrawals are prevalent and instream, complex fish habitat is limited. Fish distribution and populations are assumed to be at lower levels than prior to European settlement based on current habitat conditions.

A rating system was developed to evaluate where management and restoration activities should take place. The following criteria were evaluated from the fisheries resource perspective.

Aquatic habitat condition - Areas were rated was based on cutthroat trout and coho salmon habitat conditions. This rating relied heavily on professional judgement, current aquatic habitat data, and partly on personal observation by fish biologists.

Species diversity - Areas with a high degree of diversity (larger number of fish species) received the higher rating. Areas containing cutthroat trout, coho salmon, steelhead, and chinook salmon were rated the highest.

Access for anadromous fish - Areas containing natural blockages (i.e. waterfalls) would be rated low because anadromous fish would not historically have inhabited those areas.

Ownership pattern - This considers how much influence BLM actions would have on cumulative impacts. Whether or not the BLM administer enough land to affect aquatic conditions.

a. Current Riparian Reserve Conditions

(1) Roads

In the Pacific Northwest, one of the main concerns associated with logging activities is increased erosion causing sediment to enter streams. Road construction and maintenance are the main sources of sediment entering streams. Buffer strips less than 100 feet wide do not prevent sediment from entering the stream channels (Erman and Mahoney 1983, Packer 1967, and Trimble and Sartz 1957).

Approximately 57 percent of the roads on BLM-administered land are within 100 feet of a stream (see Table 25). The majority of these roads are considered main access routes and unlikely to be considered for full decommissioning. However, these roads could be renovated or upgraded to minimize the impacts on water quality and the aquatic habitat.

Transportation Management Objective (TMO) recommendations for the Lower South Umpqua WAU are presented in Appendix G. Culvert inventories have not been conducted in the WAU but are scheduled to be completed during the summer of 2000. Culvert inventories would focus on BLM-managed roads and BLM-administered lands. Culvert inventories could be used to identify potential watershed restoration projects in the WAU.

(2) Vegetation

The BLM administers approximately four percent (4,155 acres out of 110,419 acres) of the Lower South Umpqua WAU. Approximately 25 percent (1,024 acres out of 4,155 acres) of the BLM-administered land is in Riparian Reserves. Desired future condition is to have more than 75 percent of the Riparian Reserves in age classes greater than 80 years old. Currently, 34 percent of the Riparian Reserves are greater than 80 years old. Approximately 35 percent of the Riparian Reserves are less than 30 years old and 30 percent are between 30 and 80 years old (these numbers excluded non-forested acres in the Riparian Reserves).

(3) Large Woody Debris

Large woody debris (LWD) is an important component of the aquatic environment. Large woody debris interacts with stream geomorphic channel features to create a diversity of aquatic habitat types. The habitat created by LWD provides cover and refuge for fish. Large woody debris is also a substrate and food source for many aquatic macroinvertebrates and invertebrates, which fish eat. Large woody debris can dissipate energy associated with peak flow events and trap bedload substrates, especially in low gradient stream reaches. Trapped bedload substrates create spawning habitat for salmonids.

Past management practices, such as the stream cleaning in the 1970s, road construction, and salvaging activities in riparian areas, left many streams throughout the Pacific Northwest lacking in LWD. The carrying capacity for LWD in streams is difficult to predict, since the removal of LWD adjacent to and in stream channels occurred decades ago. Based on studies conducted in wilderness areas, it is assumed that LWD was abundant in Pacific Northwest streams in the past. Recent ODFW Aquatic Habitat Inventory data indicates well-distributed or frequently occurring LWD is lacking in the surveyed stream reaches (see Table C-3 in Appendix C).

B. Wildlife

Many wildlife species live in the different plant communities present in the WAU. The various vegetation types provide shelter, food, and habitat to over 200 terrestrial vertebrate species and thousands of invertebrate species. Sixty-seven species are of special concern. Special Status Species include Federally Threatened (FT), Federally Endangered (FE), Federally Proposed for Listing (P), Bureau Sensitive (BS), Bureau Assessment (BA), or Oregon state listed species (see Table E-1 in Appendix E). The 66 Bureau Tracking (BT) species are not considered to be Special Status Species but are listed in Table E-1in Appendix E for reference. Other species of interest are Special Attention Species (Survey and Manage or Protection Buffer species) in the Northwest Forest Plan (NFP) or Oregon Department of Fish and Wildlife priority species.

1. Federally Threatened and Endangered and Proposed Species

Four terrestrial species known to occur on the Roseburg BLM District are legally listed as Federally Threatened (FT), Federally Endangered (FE), Federally Proposed for Listing (P), or Federally Proposed for Delisting (PD). These species include the American bald eagle (Haliaeetus leucocephalus) (FT, PD), the marbled murrelet (Brachyramphus marmoratus) (FT), the northern spotted owl (Strix occidentalis caurina) (FT), and the Columbian white-tailed Deer (Odecoilus virginianus leucurus) (FE, PD). Three other legally listed species may occur on the Roseburg BLM District. They are the Canada lynx (Felix lynx canadensis) (P), the Fender's Blue butterfly (FE), and the vernal pool fairy shrimp (Branchinecta lynchi) (FT). The vernal pool fairy shrimp is listed in California and has been documented occurring on the Medford BLM District. It is unknown if the vernal pool fairy shrimp is present on the Roseburg BLM District.

a. The Northern Spotted Owl

The northern spotted owl is found in the Pacific Northwest, from northern California to lower British Columbia, Canada. The geographic range of the northern spotted owl has not changed much from its historical boundaries. Nesting habitat historically used by spotted owls has changed to the point owl population numbers have declined and distribution rearranged. These changes are considered to be a result of habitat alteration and removal by timber harvesting, fire, and land development (Thomas et al. 1990).

Suitable forest stands where northern spotted owls have been located are known as spotted owl activity centers or master sites. There are no known northern spotted owl activity centers or master sites in the Lower South Umpqua WAU. Two spotted owl areas are outside the boundary and at or within 1.3 miles of the WAU boundary.

Forest habitat important to the northern spotted owl was identified by Roseburg BLM District biologists. Using on-the-ground knowledge, inventory descriptions of forest stands, and known characteristics of the forest structure, two habitat types were described and labeled Habitat 1 (HB1) and Habitat 2 (HB2). Habitat 1 describes forest stands that provide nesting, foraging, and resting components. Habitat 2 describes forest stands that provide foraging and resting components but lack nesting components. There are approximately 1,408 acres off suitable northern spotted owl habitat in the WAU (see Map 21 and Table 31). About 35 percent of the BLM-administered lands and about one percent of the WAU are considered to be suitable northern spotted owl habitat.

Table 31. Number of Acres and Percent of Suitable Northern Spotted Owl Habitat Within The Lower South Umpqua WAU.

Species	Habitat 1	Habitat 2	Total
Northern Spotted Owl	489	919	1408
	34.7%	65.3%	100%

(1) Dispersal Habitat

Other areas not fitting into the HB1 or HB2 category and greater than 40 years old are considered to be dispersal habitat. Dispersal habitat refers to forest stands greater than 40 years old that provide cover, roosting, foraging, and dispersal components northern spotted owls use while moving from one area to another (Thomas et al. 1990, USDI 1992a, and USDI 1994). There are approximately 749 acres of dispersal habitat in the WAU.

(2) Critical Habitat for the Recovery of the Northern Spotted Owl

There are no designated Critical Habitat Units for the recovery of the northern spotted owl in the WAU.

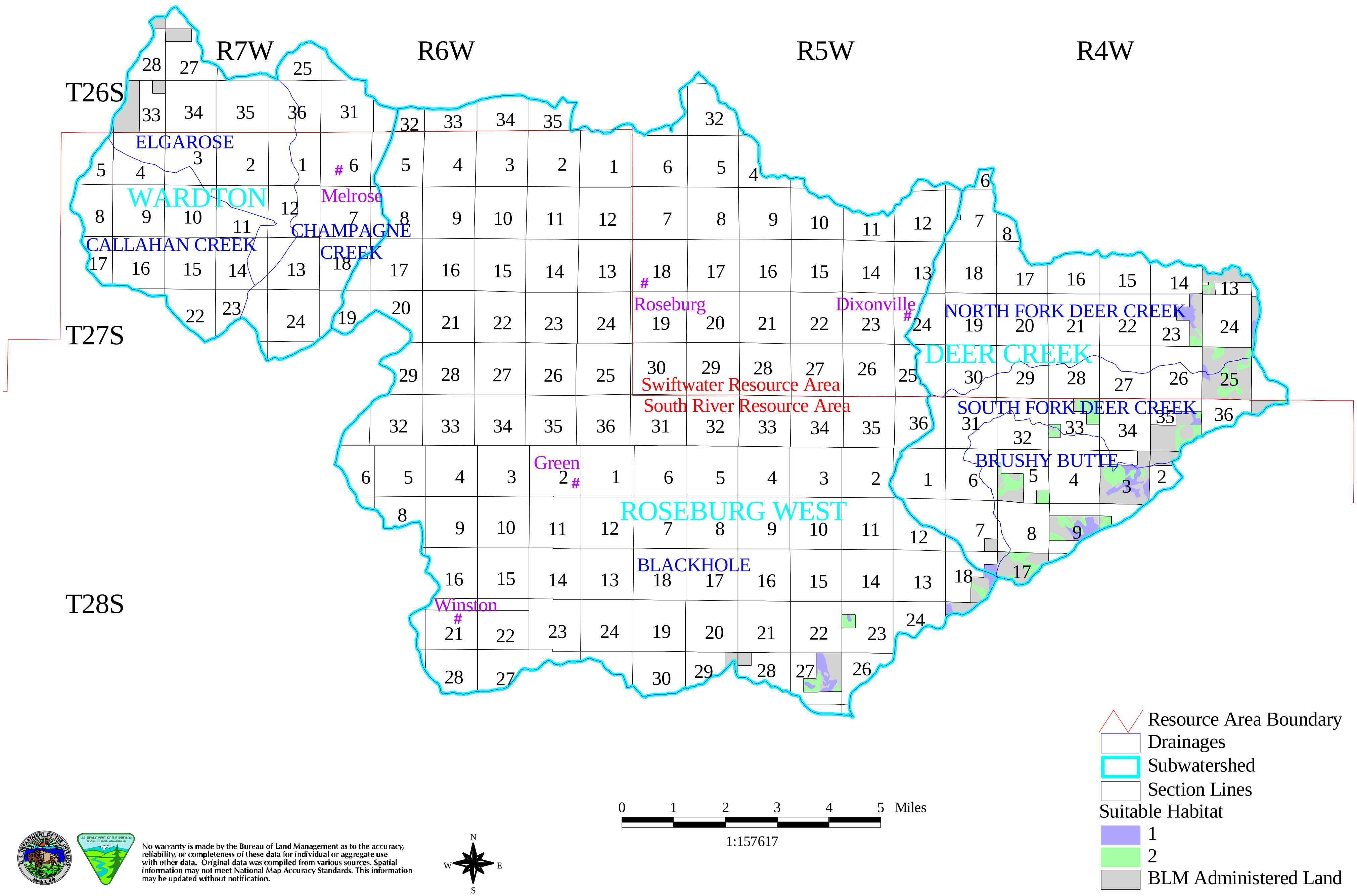
b. The American Bald Eagle

Historical distribution of the bald eagle included the entire northwestern United States (California, Oregon, and Washington), Alaska, and western Canada. Bald eagle populations probably started declining in the nineteenth century but did not become noticeable until the 1940s (USDI 1986).

Throughout the North American range, drastic declines in bald eagle numbers and reproduction occurred between 1947 and the 1970s. In many places, the bald eagle disappeared from the known breeding range. The reason for this decline was the impact organochloride pesticide (DDT) use had on the quality of egg shells produced by bald eagles (USDI 1986). Bald eagle numbers probably declined on the Roseburg BLM District because DDT was used in western Oregon from 1945 to the 1970s (Henny 1991). Other causes of bald eagle decline included shooting and habitat deterioration (Anthony et al. 1983). Historically, removal of old-growth forest stands near major water systems (e.g., South Umpqua River) contributed to habitat deterioration through the loss of bald eagle nesting, feeding, and roosting habitat.

Information collected during yearly inventories (1971 to 1995) by Isaacs and Anthony (1995) of known bald eagle sites in Douglas County, Oregon did not list any sites, nests, or territories within or near the

Map 21. Lower South Umpqua Watershed Analysis Unit
Northern Spotted Owl Suitable Habitat



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data was compiled from various sources. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

Lower South Umpqua WAU. Bald eagles are occasionally seen along the South Umpqua River during the fall or spring when adults are moving through the area. Bald eagles have been seen in the winter but do not appear to be using the area as a long term wintering area. One pair of bald eagles is suspected to be nesting on private land along the South Umpqua River within the WAU.

c. The Marbled Murrelet

The marbled murrelet was listed as a threatened species in 1992 (USDI 1992c). Critical habitat for the recovery of the marbled murrelet was designated in 1996 (Federal Register 61(102):26256-26278).

The objective of the marbled murrelet recovery plan is to ensure long-term survival and recovery of the marbled murrelet by maintaining a well-dispersed population from Washington to northern California. The marbled murrelet recovery plan identified conservation zones extending to a distance of 35 miles from the Oregon coast. The Lower South Umpqua WAU is more than 35 miles from the Oregon coast and outside of the marbled murrelet conservation zones.

The western portion of the Lower South Umpqua WAU is less than 50 miles from the Oregon coast, which is considered to be the extent of suitable marbled murrelet forest habitat. Information about the biology and inland nest sites indicates the marbled murrelet is unlikely to be found more than 50 miles from the Oregon coast (USDA and USDI 1994a and USDI 1992c). Approximately twelve acres of suitable marbled murrelet habitat in the WAU are less than 50 miles from the Oregon coast (see Map 22).

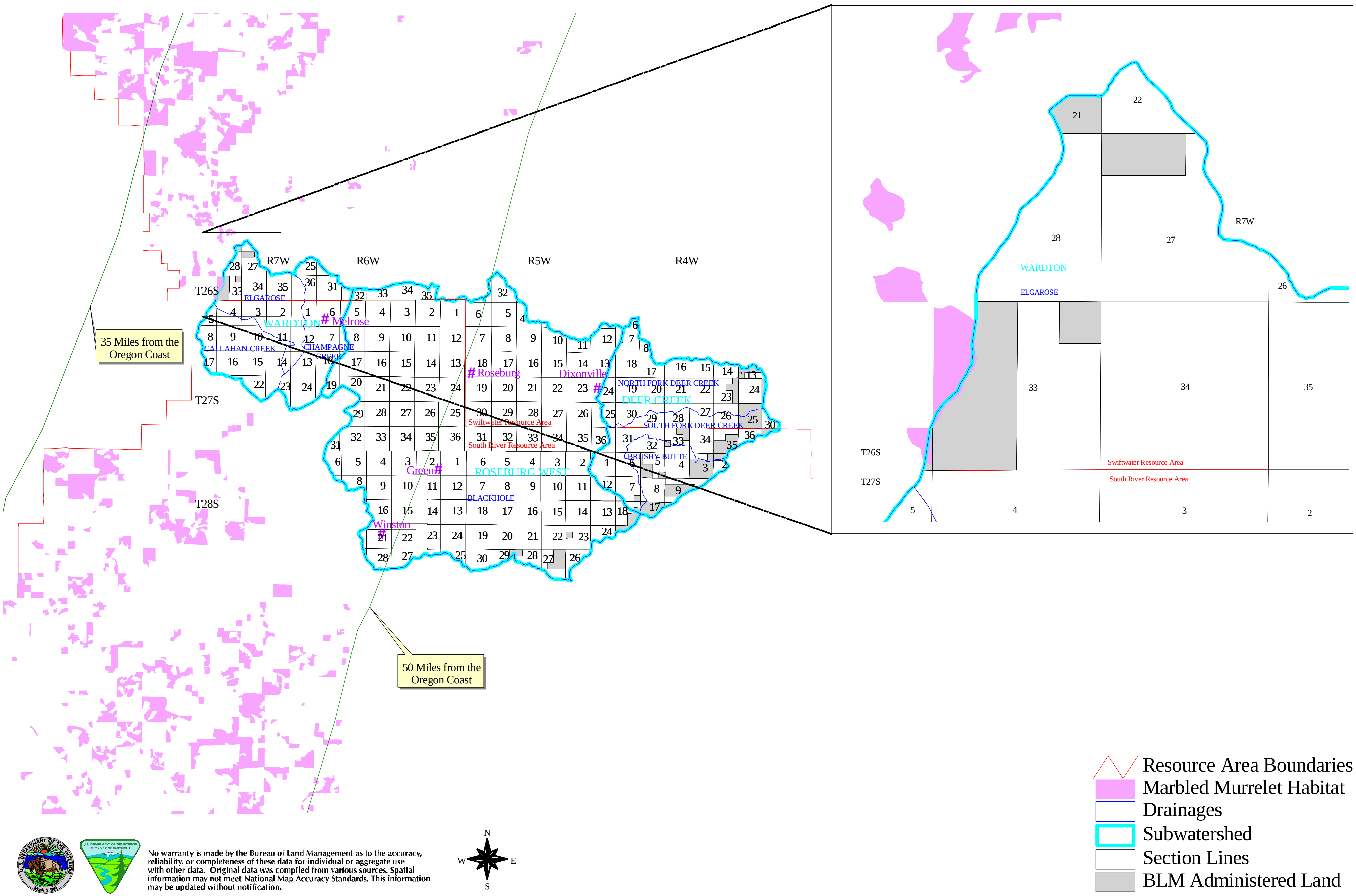
d. The Columbian White-tailed Deer

The Columbian white-tailed deer was listed as Federally Endangered in 1978. The Lower South Umpqua WAU is within the historic and current Columbian white-tailed deer distribution range (USDI 1983 and USDA and USDI 1994a).

The Columbian white-tailed deer is present in the WAU. The known Columbian white-tailed deer population inhabits an area east and northeast of Roseburg. This area includes the northeastern portion of the WAU (USDI 1983). The watershed directly north of the Lower South Umpqua WAU also includes suitable Columbian white-tailed deer habitat (USDI 1997).

Columbian white-tailed deer use the grasslands, pastures, and riparian zones along the North Umpqua River and creeks in the lower elevation valleys. The Columbian white-tailed deer geographic range in Douglas County extends from northeast of Oakland to Cow Creek near Riddle. Most of the Columbian white-tailed deer inhabit riparian lowlands between Glide and Winchester, north of Buckhorn road and south of the North Umpqua River. Oregon white oak (Quercus garryana) and California black oak (Quercus kelloggii) are the dominant vegetation with red alder (Alnus rubra) and big-leaf maple (Acer macrophyllum) occurring in the riparian zones (USDI 1983).

Map 22. Lower South Umpqua Watershed Analysis Unit
Marbled Murrelet Habitat



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data was compiled from various sources. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

The Columbian white-tailed deer population has been monitored since 1975. The number of Columbian white-tailed deer was 1.7 animals per mile in 1975, 2.2 animals per mile in 1986, and ranged from 4.1 to 7.7 animals per mile between 1987 and 1999 (USDI 1997).

The Roseburg population of Columbian white-tailed deer is proposed to be delisted as a Federal Endangered species. The North Bank Habitat Management Area, managed by the Roseburg BLM District, is being managed to maintain a "viable" population of Columbian white-tailed deer.

e. The Canada Lynx

The Canada lynx was proposed by the USFWS for listing as a Federal Threatened species on July 8, 1998. The listing would apply to lynx populations in Washington, Oregon, and 14 other states from Idaho to Vermont. Nine counties in Oregon had historical records of lynx populations (USDI 1998). A self-sustaining resident lynx population does not exist in Oregon but individual animals are present (Verts and Carraway 1998). The lynx has not been reported as occurring in Douglas County. Although, it has been documented to be present in the Cascade and Blue Mountains in Oregon (USDI 1998). The lynx occurs in areas receiving large amounts of snow during the winter and where the snowshoe hare lives.

f. Fender's Blue Butterfly

The Fender's Blue butterfly was listed as a Federal Endangered species on January 25, 2000. This butterfly is currently restricted to the Willamette Valley (Federal Register 2000 and ONHP 1998). The life cycle of the Fender's Blue butterfly is dependent on a few species of lupine, especially Kincaids lupine (Lupinus sulphurous ssp. kincaidii). The caterpillar feeds on the lupine during its growing period prior to changing into a butterfly.

Kincaids lupine occurs in the South River Resource Area and suspected to occur in the Lower South Umpqua WAU. It is unknown if the Fender's Blue butterfly is present in the Lower South Umpqua WAU.

g. The Vernal Pool Fairy Shrimp

The vernal pool fairy shrimp inhabits temporary pools of water in grass or mud bottomed swales (Federal Register 1994). The known distribution range is restriction to the Central Valley in California. However, it is possible the vernal pool fairy shrimp may occur in southern Oregon. Private lands in the valleys of the WAU may have habitat, temporary water pools, which could be used by this shrimp species. The vernal pool fairy shrimp is not expected to occur on BLM-administered lands in the WAU.

2. Bureau Sensitive Species

There are 47 Bureau Sensitive animal species occurring on the Roseburg BLM District. Table E-1 in Appendix E lists the species suspected to occur in the Lower South Umpqua WAU.

a. The Peregrine Falcon

Peregrine falcons were a "common breeding resident" along the Pacific coastline and present in many other areas, including southwestern Oregon (Haight 1991). Peregrine falcon populations in the Pacific Northwest declined because of organochloride pesticide use, other chemicals (avicides, such as organophosphate) used to kill other bird species considered to be pests, shooting, and habitat disturbance (loss of wetlands and fresh water marsh environments in interior valleys and increased rural development) (Aulman 1991).

Peregrine falcons occur in the South River Resource Area. However, there is no record of an occupied site within the Lower South Umpqua WAU, as of 1995. An evaluation using aerial photographs and on-the-ground reviews determined rock outcrops or cliff habitats do not occur in most of the WAU. Evaluation of high elevation areas in the eastern portion of the WAU is continuing.

The peregrine falcon has been delisted and is no longer considered a Federal Endangered under the Endangered Species Act of 1973, as amended. The peregrine falcon is now considered to be a Bureau Sensitive species. Its status will be reevaluated after five years of monitoring, in 2004.

b. The Northern Goshawk

Information about the northern goshawk is readily available (Marshall 1991). However, most of the work with this species was conducted east of the Cascade Mountains. Current geographic distribution suggests the northern goshawk would not be expected to occur in most of the Roseburg BLM District. Observations recorded since 1984 show the northern goshawk is present north of the expected distribution range in Josephine County, Oregon. All of the northern goshawk nest sites found on the Roseburg BLM District since 1980 have been located outside of the Lower South Umpqua WAU. Older forest stands are potential northern goshawk habitat but has not been surveyed in the WAU.

c. Bat Species

During the summer of 1994, a survey to identify the bat species present in the South River Resource Area was conducted by Dr. Steve Cross of Southern Oregon College in Ashland, Oregon. Bat species use unique habitats like caves, talus, cliffs, snags, and tree bark for roosting, hibernating, and maternity sites. These components may be near or within vegetated areas, such as young or old forest stands. Bats also use other unique habitats (ponds, creeks, and streams) to find food and water. Special status bat species present on the Roseburg BLM District are expected to occur in the Lower South Umpqua WAU.

d. Amphibians

Amphibian inventories were conducted in the South River Resource Area in 1994 and 1997 (Bury 1995 and Bury 1997). These inventories document the amphibian species in the area. The spotted frog is not expected to occur in the WAU and was not found during the 1994 inventory. Species like the Southern Torrent salamander (Rhyacotriton variegatus), western red-backed salamander (Plethodon vehiculum), Dunn's salamander (Plethodon dunni), and other regional species were not documented but are expected to occur in the WAU.

Amphibian species like the northern red-legged frog, foothill yellow-legged frog, and clouded salamander use unique habitats within many different vegetation types. Features like large down woody material, talus slopes, creeks, seeps, ponds, and wetlands are often used by amphibian species in southwestern Oregon. Because these features are found in the Lower South Umpqua WAU, amphibian species are expected to occur in the WAU.

3. Bureau Assessment Species

Five terrestrial animal species on the Roseburg BLM District are considered to be Bureau Assessment (BA) species. Bureau Assessment species are not included as Federal or State listed species but are of concern in Oregon or Washington. The five species include the Brazilian free-tailed bat (Tadarida brasiliensis mexicana), the common loon (Gavia immer), the merlin (Falco columbarius), the red-necked grebe (Podiceps grisegena), and the snowy egret (Egretta thula).

a. The Brazilian Free-tailed Bat

The distribution range of the Brazilian free-tailed bat extends from southwestern Oregon to the Carolinas and south to Central America (Verts and Carraway 1998 and Csuti et al. 1997). The Brazilian free-tailed bat uses caves, tree hollows, barns, houses, and other buildings. The Brazilian free-tailed bat has been documented in the Lower South Umpqua WAU. The warmer temperatures in the lower elevations may provide the conditions this bat prefers.

b. The Common Loon

The common loon is occasionally observed on lakes and major rivers in Douglas County, Oregon. Although, the South Umpqua River flows through the WAU and there are some large constructed lakes a breeding population is not expected to occur in the WAU.

c. The Merlin

The merlin is a bird of prey (falcon) not commonly seen in Douglas County, Oregon. The merlin has been documented breeding in Douglas County, Oregon (Umpqua Valley Audubon Society 1997).

d. The Red-necked Grebe

The red-necked grebe has been seen but is not common in Douglas County, Oregon. This grebe uses shallow lakes during its breeding season and spends winters along the Oregon Coast. It is not expected to occur in the WAU.

e. Snowy Egret

The snowy egret is not expected to occur in Douglas County, Oregon. The snowy egret's breeding range is southeastern Oregon but some wandering individuals have been documented in Douglas County, Oregon. Wetlands, marshes, and shallow lakes are the preferred habitat for this species.

4. State of Oregon Listed Species

There are 25 animals listed as threatened or endangered by the State of Oregon. The marbled murrelet, spotted owl, and bald eagle are also Federally listed. The peregrine falcon is no longer Federally Endangered but is listed as endangered by the State of Oregon.

5. Survey and Manage and Protection Buffer Species

a. Mollusks

In western Oregon and Washington, over 150 species of land snails and slugs have been identified. Mollusks can be found at most elevations and in various habitat types. Generally, snails and slugs avoid disturbed areas where habitat modification leads to loss of moisture and increased exposure to solar radiation (Frest and Johannes 1993).

Over 200 species of aquatic mollusks have been identified in western North America. These species inhabit permanent or seasonal water bodies. Most freshwater mollusks prefer cold, clear streams with dissolved oxygen (DO) near saturation levels (Frest and Johannes 1993). In 1993, Frest and Johannes stated that 108 mollusk species (57 freshwater aquatic and 51 land) were known to occur within the range of the northern spotted owl. Of these, 102 species are known or are likely to occur on Federally-administered lands.

In 1997, Frest and Johannes reported 46 mollusk species (17 land and 29 aquatic) were known to occur in Douglas County, Oregon. An additional 75 species may be present. Thirty-one of these species were analyzed in the SEIS ROD as sensitive taxons. Only five species of land snails and slugs present in Douglas County, Oregon require surveys prior to ground disturbing activities.

Three mollusk survey plots were located in the Lower South Umpqua WAU. Several species were common on most survey plots, including Ancotrema sportella, Haplotrema vancouverense, Vespericola columbianus, Ariolimax columbianus, and Monadenia fidelis fidelis. One Survey and Manage mollusk species, Prophysaon coeruluem, the blue-grey taildropper slug, was identified. The preferred habitat elements for the blue-grey taildropper are canopy closure greater than 70 percent, hardwoods, deep leaf litter, down logs, and ground vegetation such as sword fern and salal.

b. Del Norte Salamander

The Del Norte salamander (Plethodon elongatus), a Survey and Manage species, was located near Council Creek in the South River Resource Area in 1999. The farthest north known extent of the Del Norte salamander range is about twelve miles south of the WAU. The Del Norte salamander uses forested talus habitat, rocky substrates in hardwood forests, and riparian areas. Other habitat features include cool, moist conditions with moss and fern ground cover, lichen downfall, deep litter, and cobble dominated rocky substrates (IB-OR-96-161 Protocols for Survey and Manage Amphibians and BLM-IM-OR-2000-004, Survey and Manage Survey Protocols - Amphibians v. 3.0).

The Lower South Umpqua WAU falls within 25 miles of a known Del Norte salamander site. Projects in the WAU need to be evaluated to determine if surveys are required prior to ground disturbing activities (BLM-IM-OR-2000-004). If suitable rocky habitat is present, the site needs to be protected from ground disturbing activities. Evaluation of soil data indicates the WAU contains about 5,828 acres of potential Del Norte salamander habitat. Approximately 420 acres of the potential Del Norte salamander habitat are on BLM-administered land (see Map 23).

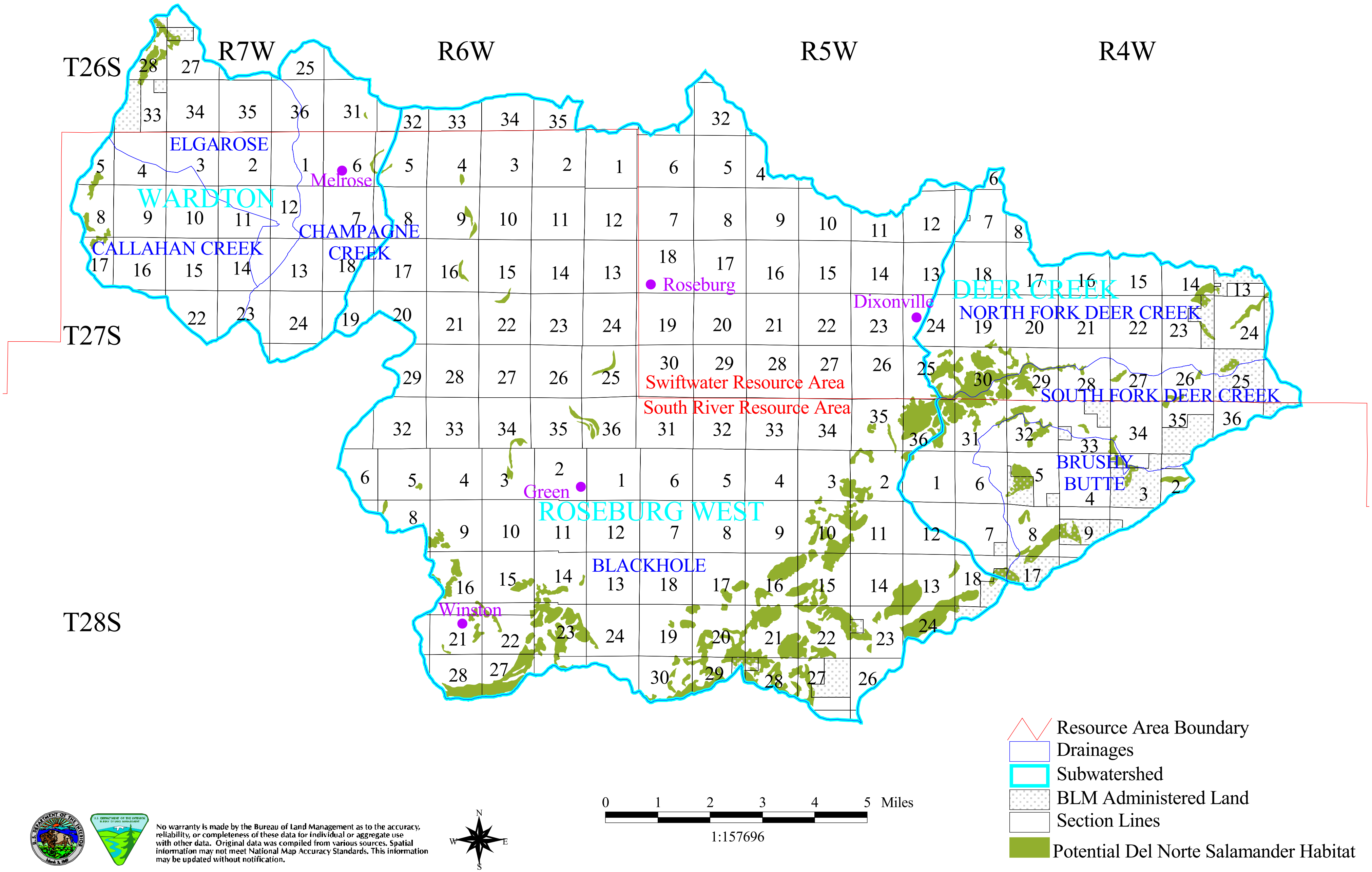
c. The Red Tree Vole

The red tree vole (Phenacomys longicaudus) is an arboreal rodent, which lives in the canopy of Douglas-fir forests in Oregon and Northern California. Its primary food is Douglas-fir needles. However, Sitka spruce, western hemlock, and grand fir needles are also eaten by red tree voles (Huff et al. 1992). The red tree vole is expected to occur in the Lower South Umpqua WAU. There are approximately 5,733 acres of Douglas-fir forest stands greater than 50 years old in the WAU. Thirty three percent (1,971 acres) of the stands are on BLM-administered land.

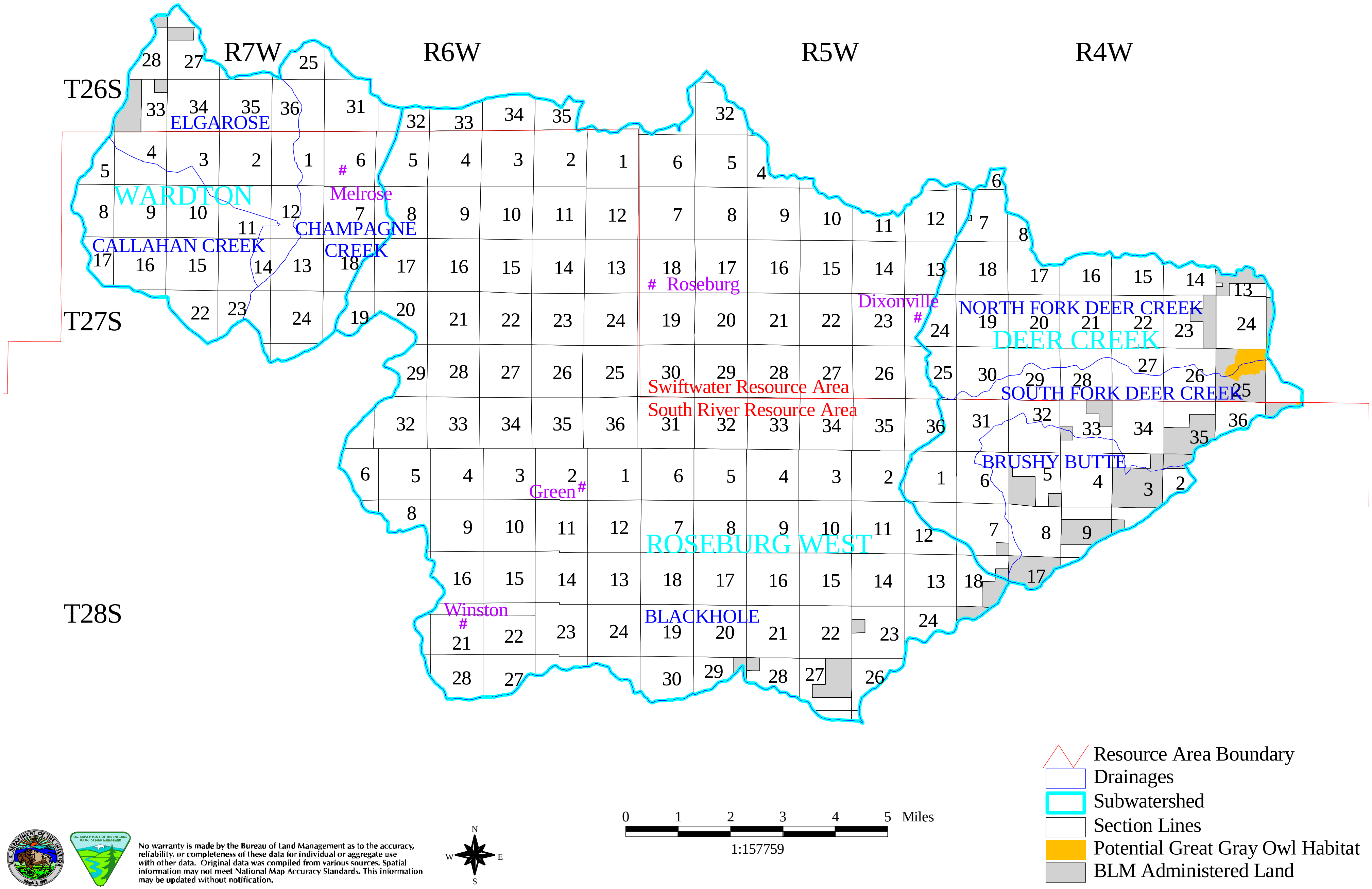
d. The Great Gray Owl

The Northwest Forest Plan (USDA and USDI 1994b) designated the great gray owl (Strix nebulosa) as a Protection Buffer species. The great gray owl has been documented as occurring on the Roseburg BLM District but is not expected to occur in the Lower South Umpqua WAU. This owl species uses forest stands for nesting while foraging in meadows or other openings. The great gray owl usually lives in areas above 2,500 feet in elevation. A small percentage of the WAU is above 2,500 feet in elevation (see Map 24).

Map 23. Lower South Umpqua Watershed Analysis Unit
Potential Del Norte Salamander Habitat



Map 24. Lower South Umpqua Watershed Analysis Unit
Potential Great Gray Owl Habitat on BLM Administered Land



6. Special Interest Species

These species are of special interest to the general public or another agency, such as the Oregon Department of Fish and Wildlife.

a. Osprey

The Lower South Umpqua WAU supports bird of prey species common to the region but estimates of local populations are not available. These raptor species occur where suitable habitat is present.

Osprey (Pandion haliaetus) nesting habitat is present along the South Umpqua River, which flows through the middle of the WAU. There are between ten and thirteen osprey nest sites in the WAU.

b. Turkey

The historic distribution range of the wild turkey (Meleagris gallopavo) extended from Arizona north and east to New England and southern Canada. Their range also extended to Veracruz, Mexico. The turkey has disappeared from its historic range. It has been introduced into California, Nevada, Oregon, Utah, Washington, and Wyoming (Csuti et al. 1997).

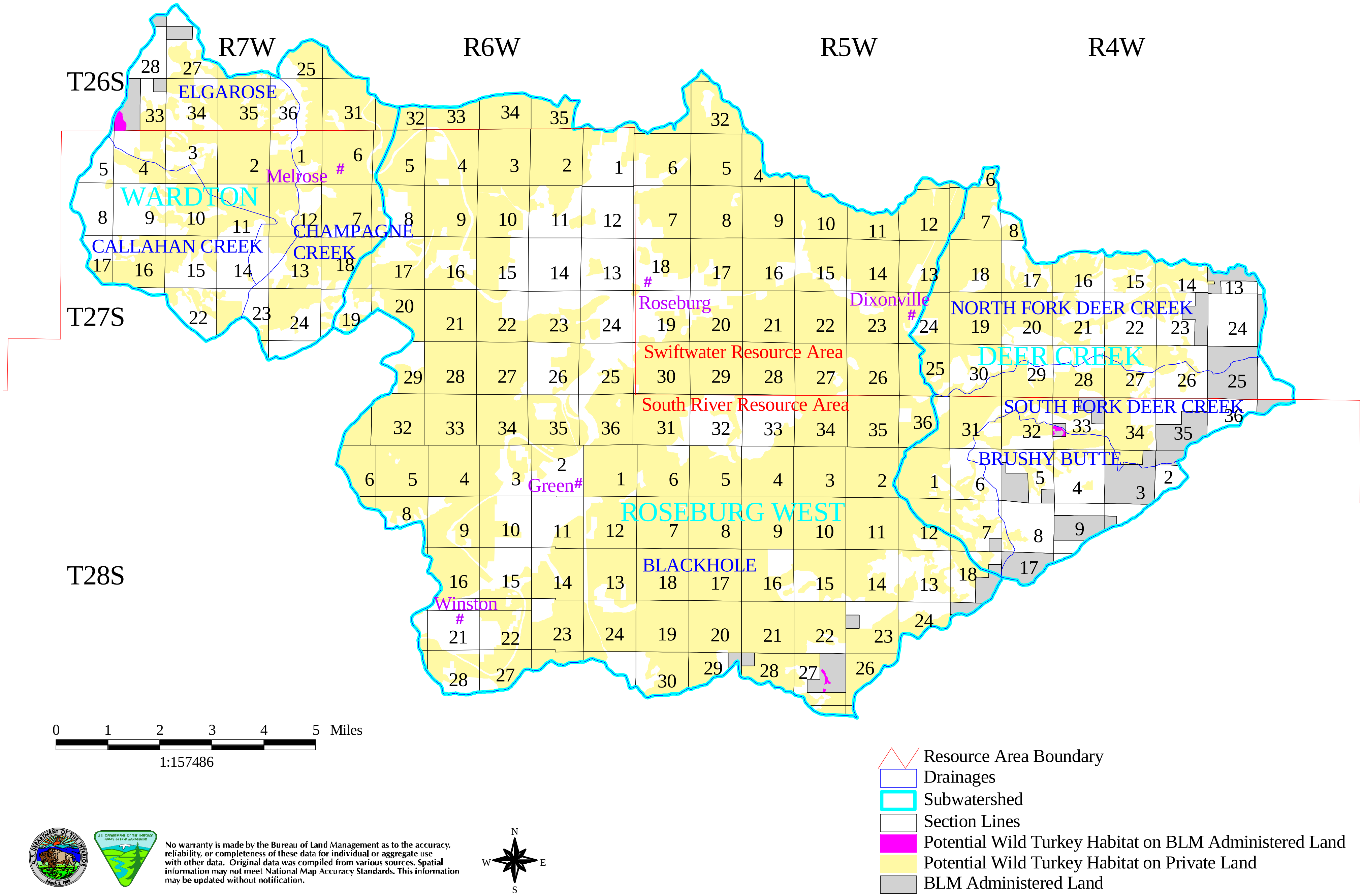
Wild turkeys inhabit savannah woodlands, young forest stands less than 10 years old, meadows, and riparian areas (Csuti et al. 1997 and Crawford and Keegan 1990). The oak savannahs present in the lower elevations of the WAU are mostly on private land. Map 25 shows where the potential wild turkey habitat (approximately 73,571 acres) occurs in the WAU. Approximately 66 acres of potential wild turkey habitat occur on BLM-administered lands in the WAU.

c. Roosevelt Elk

Historically, the range of Roosevelt elk (Cervus elaphus) extended from the summit of the Cascade Mountains to the Oregon coast. In 1938, the elk population in Oregon was estimated to be 7,000 animals (Graf 1943). Elk numbers and distribution changed as people settled in the region. Over time, elk habitat areas shifted from the historical distribution to "concentrated population centers which occur as islands across forested lands of varying seral stages" (South Umpqua Planning Unit 1979). Information about the historical distribution of elk within the Lower South Umpqua WAU and the Melrose and Tioga management units designated by ODFW, is not available. Due to the increased number of people, road construction, home construction, and timber harvesting, it is suspected the elk population has declined as reported in other parts of the region (Brown 1985).

The number of the Roosevelt elk in the Lower South Umpqua WAU are not available (Personal communication from ODFW). Elk forage for food in open areas where the vegetation includes grass-forb, shrub, and open sapling communities. Elk use a range of vegetation age classes for hiding. Hiding components include large shrub, open sapling, closed sapling, and mature or old-growth forest habitat (Brown 1985).

Map 25. Lower South Umpqua Watershed Analysis Unit
Potential Wild Turkey Habitat



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The Lower South Umpqua WAU includes part of two elk management areas identified in the Roseburg District Proposed Resource Management Plan (USDI 1994). However, management direction for these elk management areas were not discussed in the Roseburg District ROD/RMP (USDI 1995).

d. Neotropical Bird Species

Bird species that migrate and spend winter south of the North American Continent are considered to be neotropical bird species. Bird species that live on the North American Continent year round are called resident birds. Widespread concern for neotropical bird species, related habitat alterations, impacts from pesticide use, and other threats began in the 1970s and 1980s (Peterjohn et al. 1995).

Oregon has over 169 bird species considered to be neotropical migrants. Population trends of neotropical migrants in Oregon show declines and increases. Over 25 species have been documented to be declining in numbers (Sharp 1990). Oregon populations of 19 bird species show statistically significant declining trends while nine species show significant increasing trends (Sharp 1990). Including all species showing declines, increases, or almost statistically significant trends, there are 33 species decreasing and 12 species increasing in number in Oregon (Sharp 1990).

From 1993 through 1999, neotropical birds were captured and banded and habitat evaluations were conducted in the South River Resource Area. However, this work was not conducted within the WAU.

The Lower South Umpqua WAU supports populations of neotropical bird species. The WAU provides suitable habitat for neotropical species known to nest in the Roseburg BLM District. The hardwoods, shrubs, and conifers function as breeding, feeding, and resting habitat for many neotropical birds.

7. Interpretation

a. Threatened and Endangered and Federally Proposed Species

(1) The Northern Spotted Owl

Most of the suitable northern spotted owl habitat is located in the southeast portion of the WAU. Northern spotted owl territories occur in the Myrtle Creek Watershed, which is adjacent to the Lower South Umpqua WAU. However, the northern spotted owl territories do not overlap into the Lower South Umpqua WAU.

(a) Dispersal Habitat

The small amount of dispersal and suitable northern spotted owl habitat limits the value of the WAU for northern spotted owl dispersal. The portion of the WAU surrounding Roseburg is not used by dispersing northern spotted owls. There are limited amounts of conifer forests to provide cover and connect to other dispersal or suitable northern spotted owl habitat. Northern spotted owls use the habitat in watersheds surrounding the WAU.

Riparian Reserves were designated to help provide dispersal opportunities for late seral associated species. Riparian Reserves comprise approximately 25 percent (1,026 acres out of 4,155 acres) of the BLM-administered land in the WAU. Approximately 64 percent (660 acres) of the Riparian Reserves are less than 50 years old. Approximately 34 percent (348 acres) of the Riparian Reserves are at least 80 years old. Nonforested areas represent about 2 percent (17 acres) of the Riparian Reserves.

(b) Critical Habitat for the Recovery of the Northern Spotted Owl

Designated Critical Habitat Units for the recovery of the spotted owl do not occur within the Lower South Umpqua WAU. The amount of private land, distance between forested lands, and lack of suitable northern spotted owl habitat are reason why designated Critical Habitat Units do not occur in the WAU.

(2) The American Bald Eagle

The South Umpqua River valley would be suitable bald eagle habitat except for the lack of forest stands with large conifers along the river. Large remnant hardwoods (black cottonwoods) and conifers are sporadic along the river. The WAU is not considered to be an important bald eagle breeding or wintering area.

(3) The Marbled Murrelet

The WAU contains approximately twelve acres of suitable marbled murrelet habitat. Approximately 389 acres could develop into suitable marbled murrelet habitat (at least 80 years old) within the next 150 years, depending upon variables, such as the number of remnant trees, tree deformities, moss covered limbs, mistletoe, or snow breakage.

(4) The Columbian White-tailed Deer

The historic optimum Columbian white-tailed deer habitat in the WAU has been impacted to some extent by human development. The watershed directly north of the WAU has secure suitable habitat managed by the Roseburg BLM District for the recovery of the Columbian white-tailed deer (USDI 1999).

(5) The Canada Lynx

The WAU is not considered to be critical for the lynx.

(6) Fender's Blue Butterfly

The suspected presence of Kincaids lupine means Fender's blue butterfly could be suspected to occur in the WAU, also. Although, it is unknown if either of these species occur in the WAU. Kincaids lupine may occur where conditions are similar to those in the Willamette Valley.

b. Bureau Sensitive Species

(1) The Peregrine Falcon

The recent delisting of the peregrine falcon changed its status to a Bureau Sensitive species. The WAU contains open hunting areas along the South Umpqua River. Due to the lack of suitable rocky cliffs or outcrops, it is unlikely peregrine falcons are nesting in the WAU.

(2) The Northern Goshawk

The WAU contains open hunting areas along the South Umpqua River. Northern goshawks hunt in open areas while nesting in older forest stands. There is no information about northern goshawks occurring on BLM-administered land in the WAU. Northern goshawks generally selects nesting areas that are isolated. Human development in the valleys and foothills decreases the potential for finding nesting northern goshawks in the WAU.

(3) Bat Species

All of the bat species present on the Roseburg BLM District are expected to occur in the WAU. Human developments, such as buildings and bridges increase the number of potential roost sites for some bat species.

(4) Amphibians

Some of the amphibians present in the region are expected to occur in the WAU. Generally, the floodplains were amphibian habitat until human development and grazing began in the mid 1800s.

c. Bureau Assessment Species

The Brazilian free-tailed bat is present in the WAU. It is unknown if this species occurs on BLM-administered land. The merlin, snowy egret, red-necked grebe, and common loon are not expected to occur in the WAU.

d. Survey and Manage and Protection Buffer Species

(1) Mollusks

Land ownership patterns may affect suitable mollusk habitat distribution in the WAU. Suitable habitat features include conifer forest stands with greater than 70 percent canopy closure, hardwoods, deep leaf litter, down logs, and ground vegetation. Managing for late seral characteristics tends to increase the moisture retention of an area. Increased tree species diversity (especially hardwood species), down woody debris, and soil depth in late seral stands produce a more favorable moisture regime at a given site and increases the abundance and diversity of mollusks present. Mollusks increase the available nutrients at a site, increasing growth rates and moisture retention. Survey and Manage mollusk species are not expected to occur in the nonforested areas of the WAU.

(2) Del Norte Salamander

Approximately 5,208 acres of potential Del Norte salamander habitat (rock-on-rock deposits) occur mainly on private lands. Approximately 420 acres (7 percent) of the potential Del Norte salamander habitat occurs on BLM-administered land. The potential habitat on BLM-administered land is located in the southeast portion of the WAU. The quality of the rocky habitat areas is unknown.

(3) The Red Tree Vole

The red tree vole is expected to occur in the WAU on both private and BLM-administered lands. They generally inhabit conifer stands that are at least 50 years old.

e. Special Interest Species

(1) Osprey

Osprey territories occur along the South Umpqua River mainly on private lands or in the city of Roseburg.

(2) Turkey

Turkeys are found in the hardwood and pasture areas of the WAU. Bureau of Land Management administered land would not play a major role in maintaining turkey populations in the WAU. Although, some turkeys may use BLM-administered lands that are adjacent to the agricultural and hardwood areas on private land.

(3) Roosevelt Elk

Elk would not be expected to occur in the most of the WAU. Development around the city of Roseburg has removed forage and cover used by elk. Elk probably inhabit the southeastern and western portions of the WAU. These areas have forested stands intermixed with foraging areas that may be used by elk.

(4) Neotropical Bird Species

The quantity and composition of bird species inhabiting the WAU have changed due to the conversion of the oak savannah and native grasslands to agricultural uses. Approximately 32 acres of hardwood savannahs and grasslands occur on BLM-administered land.

C. Plants

1. Special Status Plants

Surveys have been conducted for Special Status Plants on portions of the Lower South Umpqua WAU. However, many Survey and Manage and Protection Buffer species do not have survey protocols developed. Appendix J2 of the Final Supplemental Environmental Impact Statement (FSEIS) was the source for information on fungi, lichens and bryophytes and their habitats. At the watershed analysis level, identifying locations of species suspected to occur in the WAU would be based on habitat. Three Special Status Plant species have been documented to occur in the WAU.

Calochortus umpquaensis (Umpqua mariposa lily), Bureau Sensitive Species
Calochortus umpquaensis is a distinct, showy perennial forb in the lily family that blooms from late May to early June. It is restricted to serpentine habitats in southwestern Oregon from southern Douglas County to northern Jackson and Josephine Counties. The plant is found in a number of different habitats ranging from woodlands to open grasslands (Fredricks 1989).

Mimulus douglasii (Kellogg's monkeyflower), Bureau Assessment Species
Mimulus douglasii grows in open woods and meadows. It grows in gravelly soil that is moist in the spring. The plant often grows on serpentine soils. It occurs below 4,000 feet in elevation. Avoid ground disturbance at known sites.

Phacelia verna (Spring Phacelia), Bureau Tracking Species
Phacelia verna is an annual forb in the waterleaf family that blooms from April to June. Its distribution range is southwest Oregon. It grows on mossy sparsely vegetated rock outcrops and balds between 500 and 6,600 feet in elevation.

Five other Special Status Plants that have been documented in South River Resource Area are suspected to occur in the Lower South Umpqua WAU.

Aster vialis (Wayside aster), Bureau Sensitive and Survey and Manage Species
Aster vialis is a rare locally endemic plant known only from Lane, Linn, and Douglas Counties in Oregon. It occurs primarily along ridges between Eugene and Roseburg. Plant succession resulting in canopy closure of the forest over these plants could be a significant management concern. Long term survival of this species may depend on controlled disturbance of the habitat to allow more light to penetrate the canopy and improve conditions for Aster vialis reproduction. The role of fire is probably important to maintaining viability. It thrives most vigorously in openings within old-growth stands or associated with edge habitat (Alverson and Kuykendall 1989).

Astragalus umbraticus (Woodland Milk Vetch), Bureau Assessment Species
Woodland milk vetch grows in open woods at low to mid elevations from southwest Oregon to northwest California. Woodland milk vetch has been observed to grow in areas impacted by fire and logging. It is likely this species has become rarer because of fire suppression activities.

Bensoniella oregona (Bensoniella), Federal Candidate and Bureau Sensitive Species
This species occurs along intermittent streams or meadow edges in mixed evergreen and white fir communities from 3,000 to 5,000 feet in elevation. It occurs less frequently in riparian shrub and forest openings, usually occupying ridgetop saddles and upper slopes with north aspects. It tolerates some disturbance if subsurface drainage is not altered. Populations are very small along streams in clearcuts. Bensoniella occurs in very specific meadow and stream edge habitats on soils derived from ancient sedimentary rocks (Copeland 1980 in Lang 1988).

Cypripedium montanum (Mountain Lady's Slipper), Tracking and Survey and Manage Species
Cypripedium montanum populations are small and scattered. Less than 20 exist west of the Cascade Mountains. Small populations may reflect the slow establishment and growth rate of this species. Cypripedium montanum persists in areas that have been burned. The species ranges from southern Alaska and British Columbia to Montana, Idaho, Wyoming, Oregon, and California. Survival of the species may depend on protecting known populations and developing a conservation plan (USDA and USDI 1994a).

Lupinus sulphureus var. kincaidii (Kincaids Lupine), Federal Threatened Species
This is one of the three varieties of Lupinus sulphureus found in Oregon. It grows in the Willamette Valley and south into Douglas County, with a disjunct population reported in Lewis County, Washington (Eastman 1990). Lupinus sulphureus has been observed growing in road cuts and jeep trails. Long term survival of this species may depend on controlled disturbance of the habitat to allow more light to penetrate the canopy and improve conditions for lupine reproduction (Kaye et al. 1991).

Other plants to consider include Protection Buffer Species suspected to occur in the WAU. Protection Buffer Species suspected to occur in the WAU include the Bryophytes Buxbaumia viridis, Rhizomnium nudum, Schistostega pennata, and Tetraphis geniculata, and the Fungus Sarcosoma mexicana. Survey and Manage plant species suspected to occur in the Lower South Umpqua WAU are listed in Table F-1 in Appendix F.

2. Noxious Weeds

Noxious weed encroachment has reduced natural resource values in the Lower South Umpqua WAU. The introduction and establishment of noxious weeds can affect native plant communities by reducing the diversity, abundance, and distribution of native plants (Bedunah 1992).

The weed management program is designed to maintain and restore desirable plant communities and healthy ecosystems. Biological controls have been approved and are used to slow or reduce the spread of established populations of widespread noxious weeds, such as non-native thistles, Saint John's wort, and Scotch broom. Mechanical and chemical treatments have been used to prevent the spread of Scotch broom and decrease visibility hazards on forest roads.

Yellow Starthistle (Centaurea solstitialis) and Rush Skeletonweed (Chondrilla juncea) have been documented as occurring in the WAU. Both of these noxious weed species have been designated as Target noxious weeds by the Oregon Department of Agriculture (ODA). Yellow Starthistle and Rush Skeletonweed are growing along and west of Interstate 5 in the WAU. There is a high potential Yellow Starthistle may spread within the WAU.

The intent of the integrated weed management program is to maintain and restore desirable plant communities and healthy ecosystems. Preventing the establishment and spread of new noxious weed populations is the best protection method. The management strategy concerning new noxious weed invasions would be to eradicate infestations before they spread to the point where eradication is not possible. Treatments in following years may be needed to eradicate invading noxious weeds. Established invasions may not allow practical or economical eradication treatments. Treatments to contain existing large populations and eradicate small, outlying populations would be used to control established invasions.

The following goals are important to minimize or avoid the spread of nonnative species.

-Inventory by species
-Identification of potential invaders
-Monitoring
-Prioritization of noxious weed species
-Habitat management and restoration
-Revegetate bare soil following disturbance
-Develop rock source management plans
-Keep records of rock surfaced roads that may have noxious weed seed.
-Equipment cleaning

VIII. Recommendations

A. Vegetation

Plant genetically selected seedlings when they are available.

Conduct silviculture activities, such as thinnings/density management, regeneration harvests, pruning, and stand fertilization in conformance with the Roseburg District ROD/RMP.

B. Fire and Fuels Management

Broadcast and pile burning should continue to be used for site preparation to reduce vegetative competition and hazardous fuel accumulations. Site preparation may include broadcast burning regeneration harvest units and burning hand or machine piled logging slash and landing decks. Burning activity fuels may also reduce wildfire hazards. When other resource concerns eliminate using prescribed fire, mechanical or manual fuels treatments may be necessary to achieve fuels management objectives. Fuels treatments can rarely be justified as the primary reason for reducing the risk of wildfire. Consider reducing wildfire risks when forest management activities create high fire risk conditions. Site preparation prescriptions should be written to achieve the silviculture objectives and reduce the fuel hazards as a secondary objective.

Consider the timing and size of forest management activities to avoid increasing the risk of unplanned wildland fire. Consider leaving some areas untreated or manipulating fuels in precommercial thinning stands. Providing fuel breaks and creating a variety of fuel types, such as by not thinning some stands, could allow wildfires to be suppressed at a smaller size.

C. Soils

Best Management Practices (BMPs) should be applied during all ground and vegetation disturbing activities. See Appendix D, Roseburg District Record of Decision and Resource Management Plan (USDI 1995) for a list and explanation of BMPs. Along with the BMPs, the Standards and Guidelines in the SEIS Record of Decision (USDA and USDI 1994b) should be implemented in order to achieve proper soil management. Best Management Practices should be monitored for implementation and effectiveness to document that soil goals are being achieved.

Consider using methods other than prescribed fire for reducing vegetative competition on Category 1 Soils unless considered essential for resource management, such as habitat improvement, tree seedling establishment, or reducing fire risks.

D. Hydrology

Limited water quality, stream temperature, and summer base flow data are available for this WAU. The BLM has not collected any water quality data. Water quality data could be collected using multi-parameter instruments, which collect diurnal data. Temperature, DO, and pH data could be collected to provide baseline data on streams in the WAU.

Consider conducting Rosgen stream surveys to classify stream types, characterize stream channel morphology, and identify potential stream restoration sites.

Use the regional curves developed by the Roseburg BLM District to predict streamflow, depth, width, and cross-sectional area of ungaged streams. The information would be useful to determine potential changes in stream morphology that may occur due to management activities and help with designing stream restoration projects.

Consider changing the Subwatershed (6^{th} field) and Drainage (7^{th} field) boundaries to those shown on Map 26. Currently, the Deer Creek Subwatershed only includes the North and South Forks of Deer Creek. The mainstem of Deer Creek is in the Roseburg West Subwatershed. The Deer Creek Subwatershed should include all of Deer Creek from where it flows into the South Umpqua River to the headwaters.

Consider planting conifers where they occurred naturally in riparian areas but are absent now.

Consider adding LWD to increase habitat complexity and help restore streams impacted by timber harvesting and road building. Thinning in Riparian Reserves would also allow trees adjacent to stream channels to grow and provide LWD in a shorter amount of time than without any management.

Use bioengineering techniques with stream restoration opportunities. Avoid using rip rap and gabion baskets in the stream channel.

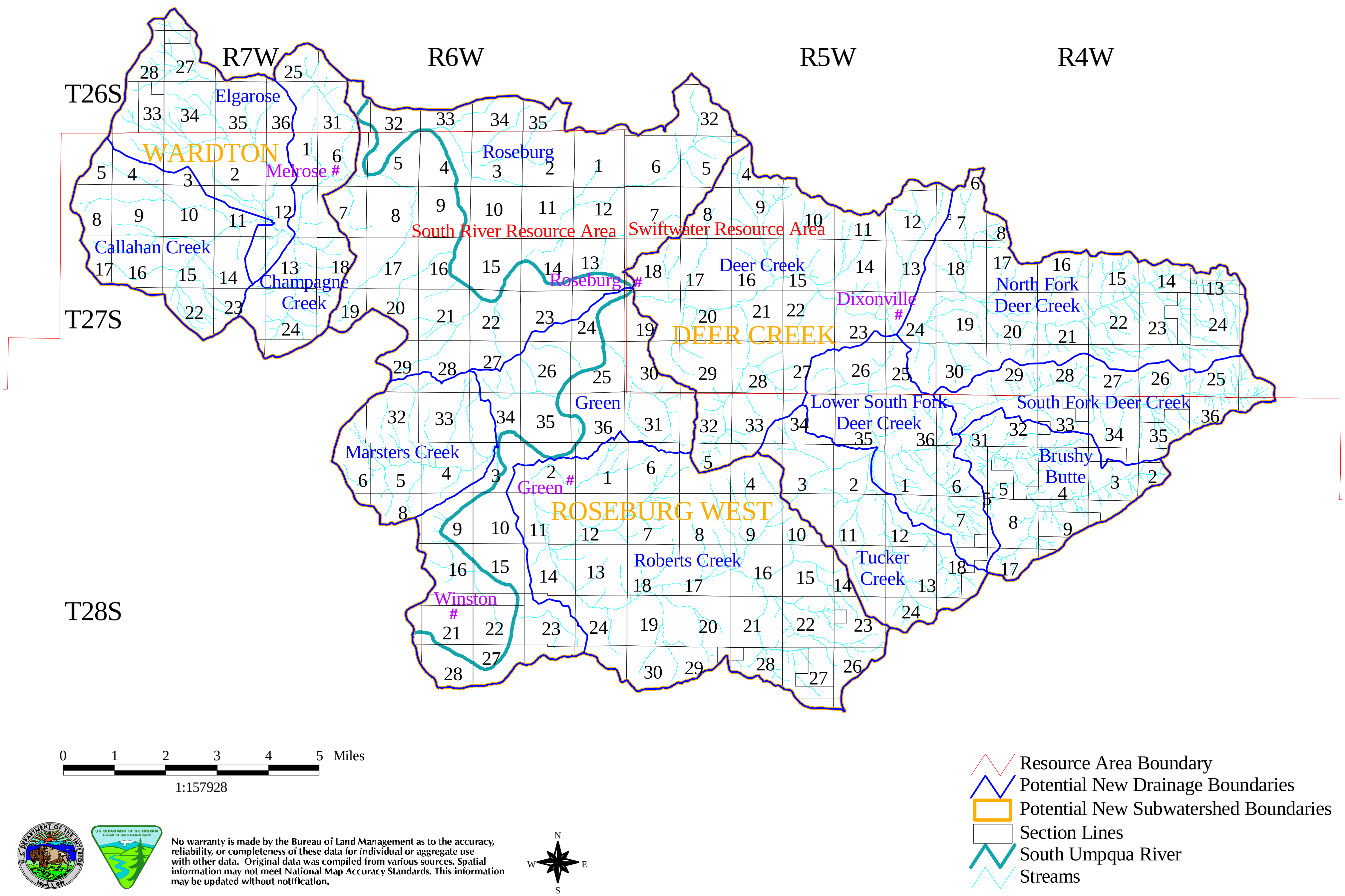
Do not construct check dams in stream channels.

Monitor stream restoration projects for temperature, turbidity, sediment, and channel morphology changes.

Conduct stream surveys to help design stream restoration projects, such as removing culverts when decommissioning roads or replacing culverts on fish bearing streams.

Refer to the TMO file for a list of roads observed to be causing water quality problems. Some roads to consider fully decommissioning or improving are listed in Appendix G. Roads within Riparian Reserves, that have been identified as causing water quality problems and in Drainages with the highest road densities would be considered first for full decommissioning.

Map 26. Lower South Umpqua Watershed Analysis Unit
Potential New Subwatershed and Drainage Boundaries



Determine where culverts block fish passage, need to be repaired or replaced, are inadequate to accommodate a 100-year flood, and where additional culverts, waterbars, or waterdips would reduce stream network extension. Plugged culverts that divert water onto the road can cause some of the most serious road related problems. The water flow diverted from one channel to another may cause road failures, stream downcutting, and bank erosion. Water dips or waterbars should be installed to prevent ditch flow from entering another stream. When there is a potential for water to be diverted the road crossing fill should be hardened and a water dip installed directly over the stream crossing to allow streamflow to travel over the road and back into the stream channel.

When fertilizing in the WAU, provide adequate buffers on streams and monitor activities. Where streams or other water bodies have a pH above 8.0 or in municipal watersheds, apply the fertilizer so it would not lead to an increase in pH or primary productivity in the stream.

Consider planning regeneration harvests and commercial thinnings where existing roads can be used to minimize the amount of new road construction.

The amount of forested land less than 30 years old, the road and stream densities, the amount of land in the TSZ, and the proposed project should be considered when analyzing the potential impacts of management activities.

Reducing road densities, improving roads, and identifying stream restoration projects would probably be the most effective restoration activities in the WAU. Thinning in the Riparian Reserves should be considered where opportunities exist.

Consider opportunities to adjust Riparian Reserve widths within the WAU. The Riparian Reserve Evaluation Techniques and Synthesis module should be used as a guide when considering adjusting Riparian Reserve widths.

E. Fisheries

1. General Fisheries Recommendations for the WAU

Watershed restoration opportunities may be closely linked to land management activities (i.e. road construction or timber harvesting) for the purpose of mitigating management activities. Streams with fair or good habitat condition ratings, high species diversity, low gradients, and easily accessible habitat should be priority areas for watershed restoration.

Follow the Terms and Conditions of the National Marine Fisheries Service (NMFS) March 18, 1997 Biological Opinion for road construction, maintenance, and decommissioning; livestock grazing, mining, and riparian rock quarry operation (USDC 1997).

Describe how projects within Riparian Reserves meets Aquatic Conservation Strategy objectives.

Analyze the amount of soil disturbance, timber falling, and yarding within late-successional or old-growth timber stands in Riparian Reserves. Salvage activities in late seral aged stands within Riparian Reserves should not retard or prevent attainment of Aquatic Conservation Strategy objectives.

Follow NMFS guidance on timber salvaging activities in riparian areas. Salvage only the portion of tree in the road prism, leaving the portion of the tree that reached the stream.

Consider reducing road densities where peak flows have negatively altered stream channel condition and impacted the fisheries resource. Prioritize the road restoration needs based on information in the Transportation Management Objectives (TMOs). Consider decommissioning roads in Drainages containing the most acres in the Transient Snow Zone and anadromous fish-bearing stream reaches. Priorities for road decommissioning would be valley bottom, midslope, and then ridgetop roads.

Use existing roads, as much as possible, when planning land management activities in the WAU. Construct new stream crossings and roads within Riparian Reserves only when necessary.

2. Specific Fisheries Recommendations for the WAU

The BLM has limited stream restoration opportunities in the Lower South Umpqua WAU. The BLM administers approximately two miles of anadromous fish-bearing stream, based on fish distribution data provided by ODFW. Approximately 1.25 miles on the Middle Fork of South Deer Creek, approximately 0.5 miles on the South Fork of Deer Creek, and approximately 0.25 miles on the North Fork of Deer Creek are considered to be anadromous fish bearing and located on BLM-administered land. The anadromous fish habitat on BLM-administered lands is located at the upper anadromous distribution limits. Due to the location and limited amount of anadromous fish habitat on BLM-administered lands, this WAU is considered to be a low priority for instream habitat restoration. However, Large Woody Debris and boulders could be placed in T28S, R4W, Section 5 on the Middle Fork of South Deer Creek. These structures would provide pool habitat and cover for fish.

F. Wildlife

Due to the lack of habitat available on and the limited amount of BLM-administered land in the WAU, the Canada lynx, bat, amphibian, osprey, turkey, Roosevelt elk, and Bureau Assessment species do not have specific management recommendations.

1. Threatened and Endangered and Federally Proposed Species

a. The Northern Spotted Owl

The suitable northern spotted owl habitat is probably important for owls near the WAU. Habitat for dispersing northern spotted owls between the eastern and western portions of the Lower South Umpqua WAU is not present.

b. The American Bald Eagle

Bald eagles have not been observed using the WAU for nesting during several years of osprey surveys in the WAU. However, osprey surveys are not conducted during the best times for detecting bald eagles. Even though BLM-administered land does not occur along the South Umpqua River consider collecting bald eagle data by conducting winter surveys.

c. Marbled Murrelet

Follow the terms and conditions from the USFWS if management activities would remove or disturb the twelve acres of marbled murrelet habitat in the WAU.

d. The Columbian White-tailed Deer

Bureau of Land Management administered lands in the WAU are not considered to be important for the recovery of the Columbian White-tailed deer. Management of BLM-administered lands in the WAU could use information developed in the North Bank Habitat Management Area.

e. Fender's Blue Butterfly

The caterpillar of the Fender's blue butterfly is closely associated with Kincaids lupine and other lupine species. It is suspected Kincaids lupine occurs in the WAU, so it is possible the butterfly occurs, also. The BLM-administered lands may contain Kincaids lupine habitat.

Consider conducting general surveys to locate Kincaids lupine. Kincaids lupine populations discovered should be monitored to detect the presence of Fender's blue butterfly caterpillars.

2. Bureau Sensitive Species

a. The Peregrine Falcon

Peregrine falcon are not suspected to be found nesting in the WAU. However, peregrine falcons may hunt for food in the valleys.

Consider following specific management guides if high potential peregrine falcon habitat is found. Management guides include locating a no activity buffer around an active peregrine falcon site, seasonal restrictions during the peregrine falcon breeding season from January 1 to July 31, or maintaining the integrity of medium to high potential sites (USDI 1995 and IM-OR-2000-022). The buffer should include a no activity area of 0.25 miles to 0.75 miles (400 meters to 1,207 meters) radius around know occupied sites. A secondary zone of 0.75 miles to 1.5 miles (1,200 meters to 2,400 meters) radius reflecting the shape of the primary zone should be considered where no management activities, such as timber harvesting, road construction, or helicopters would be allowed during the breeding season. Activities may resume 14 days after fledgling or nest failure is confirmed. To maintain site integrity of a medium to high potential peregrine falcon nesting site, it should be managed as if it was occupied. Projects that require a disturbance, such as blasting, within one mile of any high potential habitat discovered in the future, should be surveyed before project initiation. A resource area biologist should determine if seasonal restrictions may be waived.

b. The Northern Goshawk

Consider evaluating habitat and conducting surveys to determine if goshawks are present in the WAU. Consider gathering information about other raptor species in the WAU.

3. Survey and Manage and Protection Buffer Species

a. Mollusks

Consider conducting general surveys in the WAU. Surveys for Survey and Manage mollusk species should be conducted according to established protocol guides before ground disturbing activities, including commercial thinning and herbicide use, are implemented. Surveys would be conducted in the following order 1) clearance surveys of management activities, 2) survey Riparian Reserves to document species presence or absence, and 3) survey managed habitats and adjacent Riparian Reserves to evaluate impacts of timber harvesting and other habitat disturbance on specific mollusk sites.

b. Del Norte Salamander

Consider evaluating potential rocky habitat to determine if it is suitable Del Norte salamander habitat. There is a small amount of potential rocky habitat in the WAU. Evaluate Del Norte salamander survey data to determine if this species might occur in the Lower South Umpqua WAU. All ground disturbing projects should be evaluated using the protocol guides (Ollivier and Hartwell 1999).

c. The Red Tree Vole

Consider conducting general surveys for red tree voles in the WAU. Conduct clearance surveys for red tree voles prior to implementation of ground disturbing activities. Follow survey protocol guides in the latest protocol survey guides (IM-OR-2000-037).

4. Special Interest Species

Neotropical Bird Species

Activities that modify habitat impact neotropical birds. This usually changes the bird species composition using a particular area. Broadcast burning, brushing, regeneration harvesting, and precommercial and commercial thinning activities impact neotropical birds by removing habitat and physically displacing birds. Displacement includes removing occupied habitat during the breeding season.

Ways to benefit neotropical birds would be to reduce the impacts from management activities that manipulate habitat. Scheduling management activities to avoid disturbing birds during nesting and breeding periods should be considered. Local populations of neotropical birds start breeding in April and May and continue through August. However, most species have young capable of flying by the beginning of July or August. Consider implementing projects impacting nesting habitat before April 1 or after July 30 of any given year.

Another way to reduce impacts is to consider the goals of Riparian Reserves when brushing, precommercial thinning, or broadcast burning areas. Consider including different prescriptions when brushing or thinning in Riparian Reserves. The different prescriptions could exclude Riparian Reserves from the activity or increase the number of shrubs and non commercial tree species that are retained.

Matrix lands outside of Riparian Reserves also contain brush and non commercial tree species used by neotropical birds. Consider retaining brush and non commercial tree species that are not competing with the desired tree species. Some projects using these recommendations have been completed. The results should be reviewed and evaluated.

IX. Summary of Recommendations

Table 32 summarizes the recommendations, based on the main concerns of current conditions in the Lower South Umpqua WAU and identifies the planning objectives to be met by implementing the management strategies and potential activities. The intent of Table 32 was to show the connection between resource management concern and the management strategies and recommended activities. The planning objectives are based on the management direction and policy addressed in the RMP (USDI 1995) and SEIS ROD (USDA and USDI 1994b). The management strategy is intended to describe general methods for meeting the objectives. The management activities are more specific opportunities that may be implemented in order to achieve the management strategy. The information presented in Table 32 is discussed in more detail throughout the watershed analysis.

Table 32. Summary Table of Resource Management Concerns in the Lower South Umpqua WAU.
Vegetation/Silviculture

Concern	Existing Situation	RMP/NFP Planning Objective	Management Strategy	Management Activity
What opportunities exist to manage overstocked stands, which have slower growth rates, are more susceptible to insects and diseases, and have an increased risk of loss due to wind and fire? How can stand density and species composition be influenced to achieve desired late-successional characteristics in the Riparian Reserves?	Approximately 650 acres of well stocked or overstocked stands on BLM-administered land could be precommercially thinned. Approximately 660 acres may be available for commercial thinning or density management.	RMP (Appendix E pp.145-154) - Riparian Reserves - Apply silvicultural practices for Riparian Reserves to control stocking and acquire desired vegetation characteristics needed to attain ACS objectives. Matrix - Precommercial and commercial thinning and fertilization would be designed to control stand density, influence species dominance, maintain stand vigor, and place stands on developmental paths.	Manage young stands to maintain or improve growth and vigor, and to improve stand structure and composition to meet ACS objectives.	Precommercial thinning and density management in the Riparian Reserves. Precommercial and commercial thinning in Matrix. Consider precommercially thinning approximately 650 acres in the next ten years. Consider commercial thinning in the Matrix within the next ten years. Consider fertilization of stands precommercially or commercially thinned, or overstocked slower growing stands in the Matrix. Provide breaks in continuous stand types.

Table 32. Summary Table of Resource Management Concerns in the Lower South Umpqua WAU.
Vegetation/Silviculture

Concern	Existing Situation	RMP/NFP Planning Objective	Management Strategy	Management Activity
Are there opportunities for Matrix lands within this WAU to provide a sustainable supply of timber and other forest commodities?	Approximately 1,567 acres of late seral stands on BLM-administered land in Matrix are available to help provide a sustainable supply of timber and other forest commodities.	RMP (p. 33) - Objectives for Matrix lands are to produce a sustainable supply of timber and other forest commodities and provide early-successional habitat.	Harvest timber and other forest products on Matrix lands.	Conduct regeneration harvest on Matrix lands in conformance with the RMP. Retain six to eight green trees on GFMA lands and 12 to 18 green trees in Connectivity/Diversity Blocks.

Table 32. Summary Table of Resource Management Concerns in the Lower South Umpqua WAU.
Roads

Concern	Existing Situation	RMP/NFP Planning Objective	Management Strategy	Management Activity
Are BLM managed roads eroding and delivering excess sediment to stream channels and adversely affecting water quality and fish? Are BLM managed roads changing peak flows, impacting stream morphology, or adding to the drainage network in the WAU?	Some BLM roads have been identified to be eroding or having slope stability concerns. Average road density of 5.66 miles per square mile and stream crossing density of 1.98 crossings per stream mile in the WAU may increase sediment in streams that is outside the range of natural variability. Data Gap - No information regarding if BLM managed roads are causing increased sediment in streams, peak flows, or the drainage network. The intermingled ownership pattern makes it difficult to reduce road densities.	RMP (pp. 72-74) - Develop and maintain a transportation system to meet the needs of users in an environmentally sound manner. RMP (p. 72) - Correct problems associated with high road density by emphasizing the reduction of minor collector and local road densities where those problems exist. RMP (pp. 19-20, ACS) - Maintain and restore the sediment regime... - The timing, magnitude, duration and spatial distribution of peak, high and low flows must be protected.	Minimizing new road construction in areas with high surface erosion rates or slope stability problems would help reduce impacts to soils, water quality, and fisheries. Stabilize existing roads where they contribute to significant adverse affects on these resources. Locate, design, construct, and maintain roads to standards meeting management objectives in the district road management plan. Prioritize and address erosion or slope stability concerns caused by roads based on current and potential impacts to riparian resources and the ecological value of the affected riparian resources. Minimize sediment delivery to streams.	Consider conducting road and stream surveys, which would include looking at downcutting of stream channels, road encroachment, and culvert surveys. Possible restoration activities could include road treatments mentioned in the Fisheries section of this table. Prioritize and schedule maintenance on roads identified to be eroding or having slope stability problems. Consider closing, stabilizing, or decommissioning roads identified to be eroding or having slope stability problems, including roads in Riparian Reserves, while considering short-term and long-term transportation and resource management needs.

Table 32. Summary Table of Resource Management Concerns in the Lower South Umpqua WAU.
Soils

Concern	Existing Situation	RMP/NFP Planning Objective	Management Strategy	Management Activity
What management activities have the potential for reducing site productivity on highly sensitive (Category 1) soils?	Category 1 Soils are highly sensitive soils formed from granitic parent materials with slopes greater than 35 percent. There are approximately 742 acres of Category 1 granitic soils on BLM-administered land in the WAU. These soils are highly sensitive to prescribed burning of slash. Category 1 soils occur in the Brushy Butte, South Fork Deer Creek, and North Fork Deer Creek Drainages.	RMP (p. 140) - Evaluate the need for burning based on soils, plant community, and site preparation criteria. Burn under conditions when a light or moderate burn can be achieved on all units to protect soil productivity. The following standards should be followed: Avoid burning on Category 1 Soils (highly sensitive). RMP (pp. 36-37) - The use of prescribed fire on highly sensitive soils (those soils recognized as unusually erodible, nutrient deficient, or with low organic matter) will be avoided. Any burning on such soils, if considered essential for resource management, will be accomplished under site specific prescriptions to accomplish the resource objectives and minimize adverse impacts on soil properties. On other soils, prescribed fire prescriptions will be designed to protect beneficial soil properties. Minimize disturbance of identified fragile sites. Appendix D (pp.129-143) contains a summary of management guidance for fragile sites. RMP (p. 35) - Improve and/or maintain soil productivity.	Preserve long term soil productivity, nutrient capital, and achieve silvicultural objectives.	Use appropriate methods for reducing vegetative competition on Category 1 Soils. Avoid broadcast burning on Category 1 Soils unless considered essential for resource management.

Table 32. Summary Table of Resource Management Concerns in the Lower South Umpqua WAU.
Fisheries

Issue	Existing Situation	RMP/NFP Planning Objective	Management Strategy	Management Activity
What opportunities exist to enhance the fisheries resource and/or the habitat?	The Oregon Coast coho salmon is listed as a threatened species under the ESA. The Oregon Coast coho salmon has been documented to occur in this WAU.	RMP (p. 40) - Promote the rehabilitation and protection of fish stocks at risk and their habitat. RMP (p. 41) - Protect, manage, and conserve Federal listed and proposed species and their habitats to achieve their recovery in compliance with the Endangered Species Act, approved recovery plans, and Bureau special status species.	a. Protect existing stream habitat conditions, water quality, and water quantity. b. Focus restoration on: 1. providing fish passage at failed or failing stream crossing sites, especially those sites located in anadromous fish-bearing stream reaches, 2. maintaining, upgrading, or decommissioning roads identified in the TMOs (see Appendix G), 3. conducting in-stream restoration, which may include in-stream structures and riparian improvement projects.	a. Consider using timing and spatial arrangement of timber harvesting and other major land disturbance activities (i.e. road construction) within this WAU to reduce adverse effects on fish species. b. Possible restoration activities could include, but may not be limited to, fish passage improvements, stabilizing roads and road fills, sidecast pullback, adding cross drains on roads with poor drainage, resurfacing existing rock roads, surfacing natural surfaced roads, blocking and subsoiling roads to reduce road density and road related sediment production, placing logs and boulders in streams to create spawning and rearing habitat, placing fine and coarse materials for over-wintering habitat, and establishing or releasing existing conifers in riparian areas.

Table 32. Summary Table of Resource Management Concerns in the Lower South Umpqua WAU.
Wildlife

Concern	Existing Situation	RMP/NFP Planning Objectives	Management Strategy	Management Activity
Is there marbled murrelet habitat in the WAU?	There are about 12 acres of potential suitable marbled murrelet habitat in the WAU.	RMP (p.41) - Protect, manage, and conserve Federal listed and proposed species and their habitats to achieve their recovery in compliance with the Endangered Species Act, approved recovery plans, and Bureau Special Status Species policies.	Protect contiguous marbled murrelet habitat within a 0.5 mile radius of any occupied site (e.g. active nest, fecal ring, or eggshell fragments, and birds flying below, through, into, or out of the forest canopy within or adjacent to a stand). Restrict human activity within occupied or nesting stands between March 1 and July 15. Protect or enhance suitable or replacement habitat during silvicultural treatments in areas not considered to be marbled murrelet habitat within the 0.5 mile radius.	Conduct two years of surveys before disturbing marbled murrelet habitat within zone 2 (approximately 50 miles from the coast).
Are there survey and manage mollusk species present in the WAU?	Five survey and manage mollusk species are present in Douglas County. One species, the blue-grey taildropper was documented to occur in the WAU.	RMP (p. 41) - Protect SEIS Special Attention Species so as not to elevate their status to any higher level of concern.	Collect information on survey and manage mollusk species present in the WAU. Identify what type of or how much habitat is necessary to manage known sites or populations.	Consider conducting general surveys in all Land Use Allocations using established protocols to identify population distribution across the landscape. Consider conducting pre- and postharvest surveys to monitor effects on mollusks. Conduct clearance surveys prior to implementing ground disturbing activities.

Table 32. Summary Table of Resource Management Concerns in the Lower South Umpqua WAU.
Wildlife

Concern	Existing Situation	RMP/NFP Planning Objectives	Management Strategy	Management Activity
Is there potential Del Norte salamander habitat within the WAU? Is the WAU within 25 miles of a known site? Is the Del Norte salamander present in the WAU?	There are approximately 420 acres of talus habitat associated with stands that are at least 80 years old on BLM-administered land. The entire WAU is within 25 miles of a known site. This salamander may be in the WAU but has not been documented as occurring in the WAU.	The Del Norte salamander is a Protection Buffer and a Survey and Manage Survey Strategy 2 Species. RMP (p.41) - Protect SEIS Special Attention Species so as not to elevate their status to any higher level of concern.	RMP (p.45) - Survey prior to activities and manage sites within the known or suspected ranges and within the habitat types of vegetation communities associated with the Del Norte salamander.	Consider conducting surveys using protocol methods to determine if suitable habitat occurs in the WAU. Conduct surveys for the Del Norte salamander prior to ground disturbing activities in the WAU.
Is there red tree vole habitat in the WAU? Is the red tree vole expected to occur in the WAU?	Approximately 5,733 acres of potential red tree vole habitat is present in the WAU. The red tree vole is expected to occur in the WAU.	The red tree vole is a Survey and Manage Survey Strategy 2 Species. RMP (p.41) - Protect SEIS Special Attention Species so as not to elevate their status to any higher level of concern.	RMP (p.42) - Survey prior to activities and manage sites within the known or suspected ranges and within the habitat types of vegetation.	Consider conducting surveys using protocol methods to determine if the red tree vole is present in the suitable habitat that occurs in the WAU. Use interim or future management recommendations.

Table 32. Summary Table of Resource Management Concerns in the Lower South Umpqua WAU.
Wildlife

Concern	Existing Situation	RMP/NFP Planning Objectives	Management Strategy	Management Activity
The northern goshawk is a Bureau Sensitive species. Is there northern goshawk habitat within the WAU?	The northern goshawk is not common in the Roseburg BLM District. The geographic range of the species includes the Roseburg BLM District. There is potential habitat in the WAU, based on GIS.	RMP (p. 41) - Manage for the conservation of Federal Candidate and Bureau Sensitive species and their habitats so as not to contribute to the need to list and to recover the species.	RMP (p. 49) - Retain 30 acre buffers of undisturbed habitat around active and alternative nest sites. Restrict human activity and disturbance within 1/4 mile of active sites between March and August or until such time as young have dispersed. Consider this species when planning or implementing ground disturbing projects.	Consider conducting field reviews to verify and evaluate potential habitat. Use standard protocol survey methods to clear areas where projects may remove or modify suitable habitat. Consider identifying and managing a post fledgling area around an activity center.
Are there neotropical bird species present in the WAU?	Neotropical bird species use the WAU for breeding, feeding, or foraging.	RMP (p. 37) - Enhance and maintain biological diversity and ecosystem health to contribute to healthy wildlife populations.	Use the watershed analysis process to address wildlife habitat issues for individual watersheds.	For projects in the WAU impacting neotropical habitat consider using seasonal restrictions, timing, different prescriptions, and other vegetation manipulation activities to mitigate impacts, when possible.

X. Monitoring

General objectives of monitoring are:
1) To determine if the plan is being implemented correctly,
2) Determine the effectiveness of management practices at multiple scales, ranging from individual sites to watersheds,
3) Validate whether ecosystem functions and processes have been maintained as predicted.

The Roseburg RMP, Appendix I provides monitoring guidelines for various Land Use Allocations and resources. Some implementation, effectiveness, and validation monitoring questions are addressed. Management actions on the Roseburg BLM District may be monitored prior to project initiation and following project completion, depending on the resource or activity being monitored.

Some key resource elements that may be monitored in the Lower South Umpqua WAU are as follows:

A. All Land Use Allocations

Are surveys for the species listed in the Roseburg District RMP, Appendix H conducted before ground disturbing activities occur?
Are protection buffers being provided for specific rare and locally endemic species and other species in the upland forest matrix?
Are the sites of amphibians, mammals, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropod species listed in Appendix H of the Roseburg District RMP being surveyed?
Are the sites of amphibians, mammals, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropod species listed in Appendix H of the Roseburg District RMP being protected?
Are high priority sites for species management being identified?

B. Riparian Reserves

Is the width and integrity of the Riparian Reserves maintained?
Are management activities within Riparian Reserves consistent with SEIS ROD Standards and Guidelines, RMP management direction, and Aquatic Conservation Strategy objectives?
Has Watershed Analysis been completed prior to on-the-ground actions being initiated in Riparian Reserves?

C. Matrix

Are suitable numbers of snags, coarse woody debris, and green trees being left following timber harvesting as called for in the SEIS ROD Standard and Guidelines and Roseburg RMP management direction?
Are timber sales being designed to meet ecosystem objectives for the Matrix?
Are forests growing at a rate that will produce the predicted yields?
Are forests in the Matrix providing for connectivity between Late-Successional Reserves?

XI. Revisions to the Watershed Analysis and Data Gaps

Watershed analysis is an ongoing, iterative process designed to help define important resource information needed for making sound management decisions. This watershed analysis would, generally, be updated as existing information is refined, new data becomes available, new issues develop, when significant changes occur in the WAU, or as management needs dictate.

Some data gaps identified in the watershed analysis include the condition of roads and culverts at stream crossings, water quality data of streams on BLM-administered land, stream type classifications, treatment opportunities for some roads in the Swiftwater Resource Area, and if some Special Status Species occur in the WAU.

Appendix A

Glossary

Appendix A

Glossary

Age Class - One of the intervals into which the age range of trees is divided for classification or use.

Anadromous Fish - Fish that are born and reared in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce. Salmon, steelhead, and shad are examples.

Aquatic Conservation Strategy - Plan developed in Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl, designed to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and restore currently degraded habitats.

Beneficial Use - The reasonable use of water for a purpose consistent with the laws and best interest of the peoples of the state. Such uses include, but are not limited to, the following: instream, out of stream and groundwater uses, domestic, municipal, industrial water supply, mining, irrigation, livestock watering, fish and aquatic life, wildlife, fishing, water contact recreation, aesthetics and scenic attraction, hydropower, and commercial navigation.

Best Management Practices (BMPs) - Methods, measures, or practices designed to prevent or reduce water pollution. Not limited to structural and nonstructural controls, and procedures for operations and maintenance. Usually, Best Management Practices are applied as a system of practices rather than a single practice.

Bureau Assessment Species - Plant and animal species on List 2 of the Oregon Natural Heritage Data Base, or those species on the Oregon List of Sensitive Wildlife Species (OAR 635-100-040), which are identified in BLM Instruction Memo No. OR-91-57, and are not included as federal candidate, state listed or Bureau sensitive species.

Bureau Sensitive Species - Plant or animal species eligible for federal listed, federal candidate, state listed, or state candidate (plant) status, or on List 1 in the Oregon Natural Heritage Data Base, or approved for this category by the State Director.

Candidate Species - Those plants and animals included in Federal Register "Notices of Review" that are being considered by the United States Fish and Wildlife Service (FWS) for listing as threatened or endangered.

> Category 1. Taxa for which the Fish and Wildlife Service has substantial information on hand to support proposing the species for listing as threatened or endangered. Listing proposals are either being prepared or have been delayed by higher priority listing work.

Commercial Thinning - The removal of merchantable trees from an even-aged stand to encourage growth of the remaining trees.

Connectivity - A measure of the extent to which conditions between late-successional/old-growth forest areas provide habitat for breeding, feeding, dispersal, and movement of late-successional/old-growth-associated wildlife and fish species.

Connectivity/Diversity Block - A land use classification under Matrix lands managed on 150 year area control rotations. Periodic timber sales will leave 12 to 18 green trees per acre.

Core Area - That area of habitat essential in the breeding, nesting and rearing of young, up to the point of dispersal of the young.

Critical Habitat - Under the Endangered Species Act, (1) the specific areas within the geographic area occupied by a federally listed species on which are found physical and biological features essential to the conservation of the species, and that may require special management considerations or protection; and (2) specific areas outside the geographic area occupied by a listed species when it is determined that such areas are essential for the conservation of the species.

Density Management - Cutting of trees for the primary purpose of widening their spacing so that growth of remaining trees can be accelerated. Density management harvest can also be used to improve forest health, to open the forest canopy, or to accelerate the attainment of old growth characteristics if maintenance or restoration of biological diversity is the objective.

District Defined Reserves (DDR) - Areas designated for the protection of specific resources, flora and fauna, and other values. These areas are not included in other land use allocations nor in the calculation of the Probable Sale Quantity.

Endangered Species - Any species defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range and published in the Federal Register.

Endemic - Native or confined to a certain locality.

Environmental Assessment (EA) - A systematic analysis of site-specific BLM activities used to determine whether such activities have a significant effect on the quality of the human environment and whether a formal environmental impact statement is required; and to aid an agency's compliance with National Environmental Protection Agency when no Environmental Impact Statement is necessary.

Ephemeral Stream - Streams that contain running water only sporadically, such as during and following storm events.

Fluvial - Migratory behavior of fish moving away from the natal stream to feed, grow, and mature then returning to the natal stream to spawn.

General Forest Management Area (GFMA) - Forest land managed on a regeneration harvest cycle of 70-110 years. A biological legacy of six to eight green trees per acre would be retained to assure forest health. Commercial thinning would be applied where practicable and where research indicates there would be gains in timber production.

GIS - Geographic Information System, a computer based mapping system used in planning and analysis.

Intermittent Stream - Any nonpermanent flowing drainage feature having a definable channel and evidence of scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria.

Issue - A matter of controversy or dispute over resource management activities that is well defined or topically discrete. Addressed in the design of planning alternatives.

Land Use Allocations - Allocations which define allowable uses/activities, restricted uses/activities, and prohibited uses/activities. They may be expressed in terms of area such as acres or miles etc. Each allocation is associated with a specific management objective.

Late-Successional Forests - Forest seral stages which include mature and old-growth age classes.

Late-Successional Reserve (LSR) - A forest in its mature and/or old-growth stages that has been reserved.

Matrix Lands - Federal land outside of reserves and special management areas that will be available for timber harvest at varying levels.

Mitigating Measures - Modifications of actions which (a) avoid impacts by not taking a certain action or parts of an action; (b) minimize impacts by limiting the degree or magnitude of the action and its implementation; (c) rectify impacts by repairing, rehabilitating or restoring the affected environment; (d) reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or (e) compensate for impacts by replacing or providing substitute resources or environments.

Monitoring - The process of collecting information to evaluate if objectives and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned.

Nonpoint Source Pollution - Water pollution that does not result from a discharge at a specific, single location (such as a single pipe) but generally results from land runoff, precipitation, atmospheric deposition or percolation, and normally is associated with agricultural, silvicultural and urban runoff, runoff from construction activities, etc. Such pollution results in the human-made or human-induced alteration of the chemical, physical, biological, radiological integrity of water.

Orographic - Of or pertaining to the physical geography of mountains and mountain ranges.

Peak Flow - The highest amount of stream or river flow occurring in a year or from a single storm event.

Perennial Stream - A stream that has running water on a year round basis.

Phenotypic - Of or pertaining to the environmentally and genetically determined observable appearance of an organism.

Precommercial Thinning (PCT) - The practice of removing some of the trees less than merchantable size from a stand so that remaining trees will grow faster.

Probable Sale Quantity (PSQ) - Probable sale quantity estimates the allowable harvest levels for the various alternatives that could be maintained without decline over the long term if the schedule of harvests and regeneration were followed. "Allowable" was changed to "probable" to reflect uncertainty in the calculations for some alternatives. Probable sale quantity is otherwise comparable to allowable sale quantity (ASQ). However, probable sale quantity does not reflect a commitment to a specific cut level. Probable sale quantity includes only scheduled or regulated yields and does not include "other wood" or volume of cull and other products that are not normally part of allowable sale quantity calculations.

Proposed Threatened or Endangered Species - Plant or animal species proposed by the U.S. Fish & Wildlife Service or National Marine Fisheries Service to be biologically appropriate for listing as threatened or endangered, and published in the Federal Register. It is not a final designation.

Resident Fish - Fish that are born, reared, and reproduce in freshwater.

Resource Management Plan (RMP) - A land use plan prepared by the BLM under current regulations in accordance with the Federal Land Policy and Management Act.

Riparian Reserves - Designated riparian areas found outside Late-Successional Reserves.

Riparian Zone - Those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables and soils which exhibit some wetness characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of these rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs and wet meadows.

Stream Order - A hydrologic system of stream classification. Each small unbranched tributary is a first order stream. Two first order streams join to form a second order stream. A third order stream has only first and second order tributaries, and so on.

Stream Reach - An individual first order stream or a segment of another stream that has beginning and ending points at a stream confluence. Reach end points are normally designated where a tributary confluence changes the channel character or order. Although reaches identified by BLM are variable in length, they normally have a range of ½ to 1-1/2 miles in length unless channel character, confluence distribution, or management considerations require variance.

Survey and Manage - Those species that are listed in Table C-3 of the Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl for which four survey strategies are defined.

Tillage - Breaking up the compacted soil mass to promote the free movement of water and air using a self drafting individual tripping winged subsoiler.

Transportation Management Objectives (TMO) - An evaluation of the current BLM transportation system to assess future need for roads, and identify road problem areas which need attention, and address future maintenance needs.

Watershed - The drainage basin contributing water, organic matter, dissolved nutrients, and sediments to a stream or lake.

Watershed Analysis - A systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives. Watershed analysis is a stratum of ecosystem management planning applied to watersheds of approximately 20 to 200 square miles.

Appendix B

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Appendix B - References

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Appendix C

Fisheries

Table C-1. Summary Table of Current Conditions in the Lower South Umpqua WAU.

Drainage Name Subwatershed Name	Road Density	Stream Density	Percent BLM Administered Land	Stream Crossing Density	Percent Less Than 30 Years Old (BLM)	Percent of Riparian Reserves at Least 80 Years Old
Brushy Butte	4.73	4.41	29	2.06	42	49
North Fork Deer Creek	3.84	3.82	7	1.78	28	35
South Fork Deer Creek	5.10	4.17	16	2.19	38	26
Deer Creek Subwatershed	4.46	4.06	14	1.99	39	37
Blackhole	6.09	2.23	1	1.96	25	47
Roseburg West Subwatershed	6.09	2.23	1	1.96	25	47
Callahan Creek	5.22	2.51	0	1.79	0	0
Champagne Creek	5.60	2.41	0	2.41	0	0
Elgarose	5.46	2.92	7	1.89	6	0
Wardton Subwatershed	5.43	2.62	2	2.03	6	0
Lower South Umpqua WAU	5.66	2.66	4	1.98	32	34

Table C-2. Habitat Bench Marks Related to Category Types

Pools	Bench Mark Weighing Scale 1-5	4-Excellent	3-Good	2-Fair	1-Poor	Row Totals
a) Pool Area %	2	≥ 45	30-44	16-29	≤ 15	
b) Residual Pool						
Small (1-3 ordered)	4	≥ 0.55	0.35 - 0.54	0.15 - 0.34	0 - 0.14	
Large (4th order and greater)	4	≥ 0.95	0.76 - 0.94	0.46 - 0.75	≤ 0.45	
Riffles						
a) Width/Depth (wetted) (ODFW)	3	≤ 10.4	10.5 - 20.4	20.5 - 29.4	≥ 29.5	
b) Width/Depth (bank full) (USFS)	3	≤ 10	11 - 15	16 - 19	≥ 20	
c) Silt/Sand/Organics (% area) (ODFW)	2	≤ 1	2 - 7	8 - 14	≥ 15	
d) Embeddedness (% by unit) (USFS)	2	0	1 - 25	26 - 49	≥ 50	
e) Gravel % (Riffles)	3	≥ 80	30 - 79	16 - 29	≤ 15	
f) Substrate dominant	3	Gravel	Cobble	Cobble	Bedrock	
subdominant (USFS)	2	Cobble	Large Boulder	Small Boulder	Anything	
Reach Average						
a) Riparian condition Species dom/subdom. (> 15 cm)	2	conifer/hdwd* Klam - hdwd*	conifer/hdwd* Klam - hdwd*	hdwd*/conifer	alder/anything	
Size (Conifers)	3	≥ 36" Klam - ≥ 24"	24 - 35" Klam - 12 - 23"	7 - 23"	≤ 6"	
b) Shade (%) (ODFW)						
Stream Width < 12 M	1	≥ 80	71 - 79	61 - 70	≤ 60	
Stream Width > 12 M	1	≥ 70	61 - 69	51 - 60	≤ 50	
LWD						
a) Pieces (lg/sm) 100 M Stream	3	≥ 29.5	19.5 - 29.4	10.5 - 19.4	≤ 10.4	
b) Vol/100 M Stream	2	≥ 39.5	29.5 - 39.4	20.5 - 29.4	≤ 10.4	
USFS - Pieces 50' or more long and 24" DBH per mile	5	≥ 70	45 - 69	31 - 44	≤ 30	
Temperatures	1	≤ 55	56 - 60	61 - 69	≥ 70	
Macroinvertebrates						
Totals for Category						

* Hardwood category does not include alder.
*Where USFS designations appear, either USFS or ODFW measurements may be used but not both.

HABITAT BENCHMARK RATING SYSTEM

100 - 82 EXCELLENT
81 - 63 GOOD
62 - 44 FAIR
43 - 25 POOR

Table C-3. ODFW Aquatic Habitat Inventory Data.

Stream	Reach	% Pool Area	Residual Pool Depth	Riffle W/D Ratio	% Fines in Riffles	% Gravel in Riffles	Riparian Vegetation (dominant/subdominant)	Riparian Conifer Size	% Shade	LWD pieces per 100m	LWD vol per 100m	Aquatic Habitat Rating
Deer Creek	1	13.6	0.7	26.7	32	46	hardwood/conifer	small	66	1.4	0.8	Poor
	2	52.8	0.8	16.8	30	57	hardwood/conifer	medium	60	3.6	1.9	Fair
	3	25.0	0.9	19.5	24	52	hardwood/conifer	medium	70	0.7	0.7	Fair
	4	20.8	0.9	30.0	13	62	hardwood/conifer	small	67	0.8	0.5	Fair
Middle Fork South Deer Creek	1	14.7	0.4	19.6	0	42	hardwood/conifer	small	74	1.6	0.7	Fair
	2	22.0	0.4	17.9	2	56	conifer/hardwood	small	65	4.1	7.2	Fair
	3	18.0	0.4	14.1	7	70	conifer/hardwood	small	55	8.7	28.0	Fair
North Fork Deer Creek	1	54.4	0.7	24.5	9	86	hardwood/conifer	small	36	1.1	0.4	Fair
	2	50.3	0.5	17.9	4	46	hardwood/conifer	medium	65	0.8	0.3	Fair
	3	64.7	0.5	16.1	2	87	hardwood/conifer	small	74	1.1	0.4	Fair
	4	46.4	0.5	12.2	7	68	hardwood/conifer	small	80	1.1	0.4	Fair
	5	36.6	0.4	13.2	2	65	hardwood/conifer	medium	81	1.0	0.5	Fair

AHR = Aquatic Habitat Rating
-- = no data available

Table C-4. List of Fish Species Occurring in the Umpqua River Basin.

TYPE	COMMON NAME	SCIENTIFIC NAME
NATIVE ANADROMOUS	Sea-run Cutthroat trout Coho salmon Summer/Winter Steelhead trout Spring/Fall Chinook salmon Green Sturgeon White Sturgeon Pacific lamprey	Oncorhynchus clarki Oncorhynchus kisutch Oncorhynchus mykiss Oncorhynchus tshawytscha Acipenser medirostris Acipenser transmontanus Lampetra tridentata
NATIVE RESIDENT	Cutthroat trout Rainbow trout Oregon (Umpqua) chub Umpqua dace Longnose dace Umpqua squawfish Largescale sucker Redside shiner Speckled dace Brook lamprey Sculpin species	Oncorhynchus clarki Oncorhynchus mykiss Oregonichthys kalawatseti Rhinichthys evermanni Rhinichthys cataractae Ptychocheilus umpquae Catostomus macrocheilus Richardsonius balteatus Rhinichthys osculus Lampetra richardsoni Cottus spp.
NON-NATIVE	Brown trout Brook trout Lake trout Kokanee Largemouth bass Smallmouth bass Sunfishes Yellow perch White Crappie Black Crappie Black Bullhead Brown Bullhead Yellow Bullhead Peamouth Striped Bass Shad Mosquito fish Threespine stickleback Olympic mudminnow	Salmo trutta Salvelinus fontinalis Salvelinus namaycush Oncorhynchus nerka Micropterus salmoides Micropterus dolomieu Lepomis spp. Perca flavescens Pomoxis annularis Pomoxis nigromaculatus Ameiurus melas Ameiurus nebulosus Ameiurus natalis Mylocheilus caurinus Morone saxatilis Alosa sapidissima Gambusia affinis Gasterosteus aculeatus Novumbra hubbsi

Sources: BLM Roseburg District PRMP/EIS, Vol. II.
Dave Harris, personal communication, ODFW-Roseburg

Table C-5. Example of Biological Assessment Matrix of Factors and Indicators
Western Cascades Geology

FACTORS	INDICATORS	PROPERLY FUNCTIONING	AT RISK	NOT PROPERLY FUNCTIONING
Water Quality	Maximum Temperature	2nd through 4th order basins: < 66 degrees Fahrenheit. 5th order or larger basins: < 69 degrees Fahrenheit.	2nd through 4th order basins: 66 - 69 degrees Fahrenheit. 5th order or larger basins: 66 - 74 degrees Fahrenheit.	2nd through 4th order basins: $\geq$ 70 degrees Fahrenheit. 5th order or larger basins: > 74 degrees Fahrenheit.
	Sediment and Turbidity	< 12% fines (< 0.85 mm) in gravel, relatively low turbidity.	12 - 17% fines (< 0.85 mm) in gravel, moderate turbidity.	> 17% fines (< 0.85 mm) in gravels, high turbidity.
Habitat Access	Physical Barriers	No man-made barriers in watershed that prevent upstream and downstream passage of age 1+ salmonids.	Some man-made barriers in watershed prevent upstream or downstream passage of age 1+ salmonids.	Most or all man-made barriers in watershed prevent upstream or downstream passage of age 1+ salmonids.
Habitat Elements	Large Woody Debris **	> 60 pieces/mile, > 24" in diameter, > 50' length. Little or no evidence of stream clean-out or management related debris flows.	30 - 60 pieces/mile, > 24" in diameter, > 50' length. Some evidence of stream clean-out and/or management related debris flows.	< 30 pieces/mile, > 24" in diameter. > 50' length. Evidence of stream clean-out and/or management related debris flows is widespread.
	Substrate	Dominant substrate is gravel or cobble, with very little embeddedness.	Gravel and cobble are subdominant substrates, with moderate amounts of embeddedness.	Bedrock, sand, silt, or small gravel substrates are dominant. Or gravel/cobble substrate with large amounts of embeddedness.
	Pool Characteristics $\geq$ 3rd order	> 30% pool habitat by area. Little or no reduction of pool volume by fine sediment or unsorted substrates (as per District roadless area stream surveys).	< 30% pool habitat by area. Moderate reduction of pool volumes by fine sediment or unsorted substrates.	< 30% pool habitat by area. Large reduction of pool volumes by fine sediment or unsorted substrates.
	Off-Channel Habitat	Active side channels relatively frequent and a result of structural influence (large wood, nick point, etc.).	Relatively few active side channels or evidence of abandoned side channels related to management activities.	Few or no active side channels and evidence of numerous abandoned side channels related to past management activities. Or side channels being formed due to aggraded channel.
	Refugia	Habitat refugia exist and are adequately buffered. Existing refugia are sufficient in size, number, and connectivity to maintain viable populations or sub-populations.	Habitat refugia exist but are not adequately buffered. Existing refugia are insufficient in size, number, and connectivity to maintain viable populations or sub-populations.	Adequate habitat refugia do not exist.

FACTORS	INDICATORS	PROPERLY FUNCTIONING	AT RISK	NOT PROPERLY FUNCTIONING
Channel Condition and Dynamics	Width/Depth Ratio and Channel Type	W/D ratios and channel types are well within historic ranges and site potential in watershed. Rosgen Type W/D Ratio A, E, G <12 B, C, F 12-30 D >40	W/D ratios and/or channel types in portions of watershed are outside historic ranges and/or site potentials.	W/D ratios and channel types throughout the watershed are well outside of historic ranges and/or site potentials.
	Streambank Condition	Relatively stable banks. Few or no areas of active erosion.	Moderately stable banks. Some active erosion occurring on outcurves and constrictions.	Highly unstable stream banks. Numerous areas of exposed soil and stream bank cutting.
	Floodplain Connectivity	Off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation, and succession.	Reduced linkage of wetland, floodplains, and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland and riparian vegetation function.	Severe reduction in hydrologic connectivity between off-channel, wetland, floodplain, and riparian areas; wetland extent drastically reduced and riparian vegetation function altered significantly.
Flow/Hydrology	Change in Peak/Base Flows	Timber harvest and roading history is such that little or no change to the natural flow regime has occurred.	Moderate amounts of timber harvest and roading have likely altered the flow regime to some extent.	Relatively high levels of timber harvest and roading have likely had a large effect on the flow regime.
	Drainage Network	Zero or minimum increase in drainage network density due to roads.	Moderate increases in drainage network due to roads.	Significant increases in drainage network density due to roads.
Watershed Conditions	Road Density and Location **	Road density < 2 miles/square mile, with no valley bottom roads.	Road density at 2 - 3 miles/square mile, with some valley bottom roads.	Road density > 3 miles/square mile, with many valley bottom roads.
	Disturbance History	< 5% ECA/decade (entire watershed) with no concentration of disturbance in unstable or potentially unstable areas, and/or Riparian Reserves; and for NWFP area (except AMAs), $\geq$15% retention of LSOG in watershed.	<5% ECA/decade (entire watershed) but disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or Riparian Reserves; and for NWFP area (except for AMAs), $\geq$15% retention of LSOG in watershed.	>5% ECA/decade (entire watershed) and disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or Riparian Reserves; does not meet NWFP standard for LSOG retention.
	Riparian Reserves **	Riparian Reserves are relatively intact, with >80% of these areas being in a late seral condition.	Riparian Reserves have been altered somewhat, with between 60-80% of these areas being found in a late seral condition.	Riparian Reserves have been substantially altered, with <60% of these areas being found in a late seral condition.
	Landslide Rates	Within 10-20% of historic, natural rates. Stream conditions not evidently altered due to management caused landslides.	Some subdrainages with >20% of landslides related to land management activities. Some stream conditions evidently altered by management related landslides.	Many subdrainages with >25% of landslides related to land management activities. Stream conditions obviously and/or dramatically altered by management related landslides.

** These values were obtained local investigations using roadless area stream surveys, historical aerial photographs, and studies of fire disturbance history.

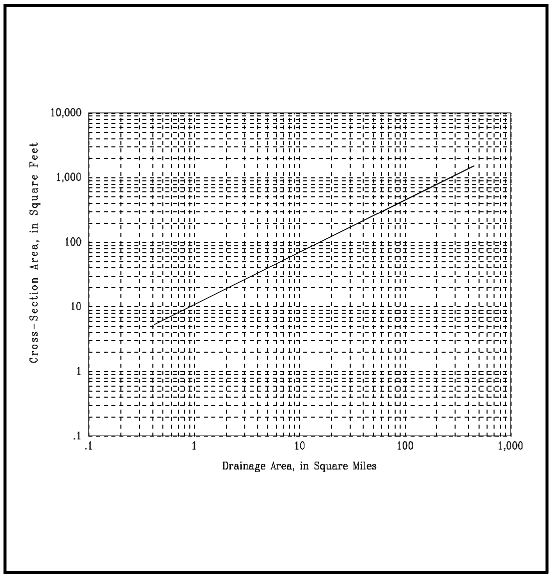
Assumptions: The matrix would be filled out as the factors and indicators pertain to fish bearing portions of a stream system. In general, these streams would be 3rd order or larger in size. There are three levels of information that are used when determining health or function of each of the indicators: 1) Facts, 2) likelihoods based upon scientific literature and theory, and 3) professional judgements (which include local, site-specific knowledge).

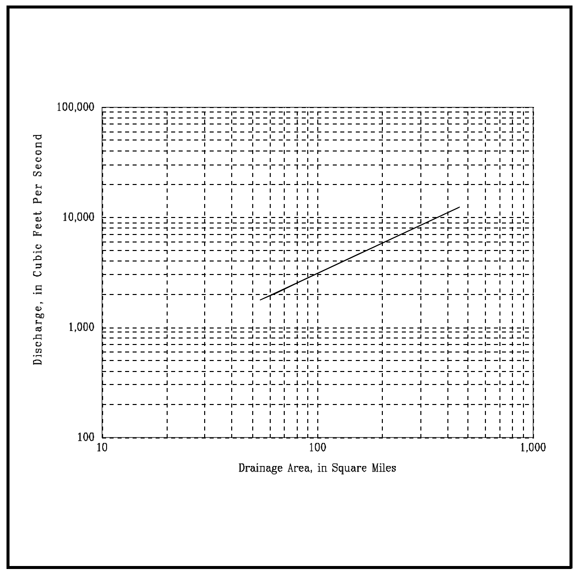
Appendix D

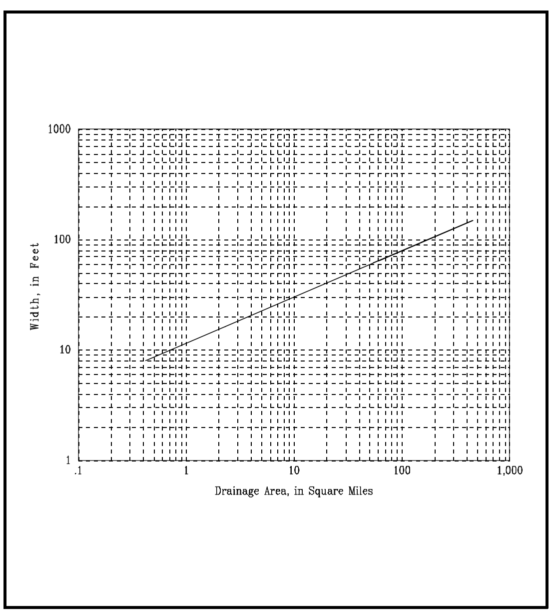
Hydrology

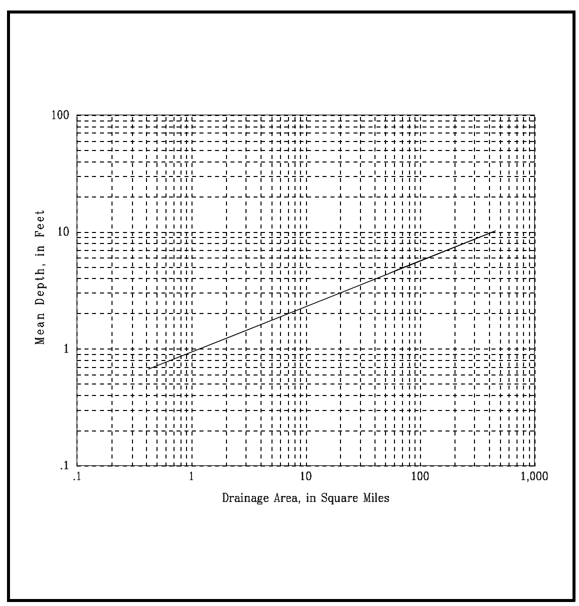
Development of regional curves using Rosgen's Level II classification can be used to predict bankfull streamflow, mean depth, width, and cross-sectional area of ungaged streams (Rosgen 1996). Graph D-1 shows regional curves developed by hydrologists in the Roseburg BLM District using the Level II classification (Kuck 2000). The classification system can be used to evaluate the processes of river mechanics and develop dimensionless ratios. The classification system can also be used to determine the feasibility of restoration projects, what structures needed to enhance and promote channel stability, and the size of culverts or bridges to install.

Graph D-1. Regional Curves for the South Umpqua River Basin Using Drainage Area to Estimate Bankfull Cross-sectional Area, Discharge, Mean Depth, and Width.









Appendix E

Wildlife

Appendix E

Terrestrial and Aquatic Animal Species Present in the Roseburg BLM District and Expected Presence in the Lower South Umpqua WAU.					
Species	**Status**	**Presence in District**	**District Monitoring Level**	**Expected in the WAU**	**Expected in Project Area****
VERTEBRATES					
FISH					
Coastal Steelhead Trout (Oncorhynchus mykiss ssp.)	FCO, V	D	3	Y	
Coho Salmon (Oncorhynchus kisutch)	FT, C	D	3	Y	
Fall Chinook (Oncorhynchus tshawytscha)	FPTO, C	D	3	Y	
Green Sturgeon (Acipenser medirostris)	BSP, XC	N	1	N	
Pacific Lamprey (Lampetra ayresi)	XC, BSP, V	D	3	Y	
Umpqua Chub (Oregonichthys kalawatseti)	XC, SV, BSPO	D	1	Y	
Umpqua River Cutthroat Trout (Oncorhynchus clarki)	V	D	3	Y	
AMPHIBIANS					
Cascades Frog (Rana cascadae)	XC, BSP, V	D	3	N	
Cascade Torrent Salamander (Rhyacotriton cascadae)	BT, V	N	3	N	
Clouded Salamander (Aneides ferrous)	U, BT	D	3	Y	
Del Norte Salamander (Plethodon elongatus)	FPB, S&M, XC, V, BSPO	U	3	U	
Foothill Yellow-legged Frog (Rana boylii)	XCO, V, BSPO	D	3	Y	
Northern Red-legged Frog (Rana aurora aurora)	XC, U, BSPO	D	3	Y	
Oregon Slender Salamander (Batrachoseps wrighti)	BTO, V	N	1	N	
Southern Torrent salamander (Rhyacotriton variegatus)	XCO, V, BSPO	D	3	Y	
Tailed Frog (Ascaphus truei)	XC, V, BSP	D	3	N	
Western Toad (Bufo boreas)	V, BTO	D	1	Y	
REPTILES					
California Mountain Kingsnake (Lampropeltis zonata)	V, BT	S	1	Y	
Common Kingsnake (Lampropeltis getulus)	V, BTO	S	1	Y	
Northwestern Pond Turtle (Clemmys marmorata marmorata)	XC, C, BSO	D	3	Y	
Sharptail Snake (Contia tenuis)	V, BT	D	3	Y	
BIRDS					
Acorn Woodpecker (Melanerpes formicivorous)	BT	D	1	Y	
Allen’s Hummingbird (Selasphorus sasin)	BTO	U	1	Y	
Bald Eagle (Haliaeetus leucocephalus)	FT, ST	D	3	Y	
Bank Swallow (Riparia riparia)	BTO, U	D	1	Y	
Burrowing owl (Speotyto cunicularia)	BSO, XC, C	N	1	N	
Common Loon (Gavia immer)	BAO	D	1	N	
Downy Woodpecker (Picoides pubescens)	HI	D	3	Y	

Terrestrial and Aquatic Animal Species Present in the Roseburg BLM District and Expected Presence in the Lower South Umpqua WAU.

Species	Status	Presence in District	District Monitoring Level	Expected in the WAU	Expected in Project Area**
Flammulated Owl (Otus flammeolus)	C, BSO	N	1	N	
Grasshopper Sparrow (Ammodramus savannarum)	BT	N	1	N	
Golden Eagle (Aquila chrysaetos)	HI	D	3	Y	
Great Gray Owl (Strix nebulosa)	FPB, V	D	3	N	
Great Egret (Casmerodius albus)	BT	D	1	Y	
Greater Yellowlegs (Tringa melanoleuca)	BTO	D	1	N	
Harlequin Duck (Histrionicus histrionicus)	XC, BSPO, U	S	2	N	
Hairy Woodpecker (Picoides villosus)	HI	D	3	Y	
Horned Grebe (Podiceps auritus)	BT	D	1	N	
Lewis' Woodpecker (Melanerpes lewis)	C, BSO	D	1	N	
Loggerhead Shrike (Lanius ludovicianus)	BT	N	1	N	
Long-billed Curlew (Numenius americanus)	BT	N	1	N	
Marbled Murrelet (Brachyramphus marmoratus marmoratus)	FT, ST, CH	D	4	Y	
Merlin (Falco columbarius)	BAO	D	1	N	
Mountain Quail (Oreortyx pictus)	BTO, U	D	1	Y	
Northern Goshawk (Accipiter gentilis)	XC, C, BSP	S	3	Y	
Northern Pygmy Owl (Glaucidium gnoma)	C	D	3	Y	
Northern Spotted Owl (Strix occidentalis caurina)	FT, ST, CH	D	4	Y	
Northern Waterthrush (Seiurus noveboracensis)	BT	N	1	N	
Olive-sided Flycatcher (Contopus cooperi)	BSPO, XC, V	D	3	Y	
Oregon Vesper Sparrow (Pooecetes gramineus)	C, BSO	U	1	Y	
Osprey (Pandion haliaetus)	HI	D	3	Y	
Peregrine Falcon (Falco peregrinus anatum)	BS, SE	D	4	N	
Pileated Woodpecker (Dryocopus pileatus)	BT, V	D	3	Y	
Purple Martin (Progne subis)	C, BSO	D	3	Y	
Pygmy Nuthatch (Sitta pygmae)	BT, V	U	1	N	
Red-breasted Sapsucker (Sphyrapicus ruber)	HI	D	3	Y	
Red-necked Grebe (Podiceps grisegena)	BAO	D	1	N	
Snowy Egret (Egretta thula)	BAO	D	1	N	
Western Bluebird (Sialia mexicana)	V, BT	D	3	Y	
Western Burrowing Owl (Speotyto cunicularia hypugea)	BSPO	N	1	N	
Western Least Bittern (Ixobrychus exiles hesperis)	BSP, XC, P	N	1	N	
Willow Flycatcher (Empidonax traillii brewsteri)	XC, BSPO, V	D	3	Y	
White-tailed Kite (Elanus leucurus)	BTO	D	1	Y	
Williamson’s Sapsucker (Sphyrapicus thyroideus)	BTO, U	N	1	N	
Yellow-bellied Sapsucker (Sphyrapicus varius)	HI	N	1	N	

Terrestrial and Aquatic Animal Species Present in the Roseburg BLM District and Expected Presence in the Lower South Umpqua WAU.					
Species	**Status**	**Presence in District**	**District Monitoring Level**	**Expected in the WAU**	**Expected in Project Area****
MAMMALS					
American Marten (Martes americana)	V, BT	S	1	N	
Black Bear (Ursus americanus)	Game	D	1	Y	
Black-tailed Deer (Odocoileus hemionus columbianus)	Game	D	1	Y	
Brazilian free-tailed Bat (Tadarida brasiliensis)	BAO	D	1	Y	
Canada Lynx (Lynx canadensis)	FT	N	1	N	
California Wolverine (Gulo gulo luteus)	XC, BSPO, ST	U	1	N	
Columbian White-tailed Deer (Odocoileus virginianus leucurus)	FE, ST	D	3	Y	
Fringed Myotis (Myotis thysanodes)	XC, V, BSP, FPB	D	3	Y	
Long-eared Myotis (Myotis evotis)	XC, BSP, U, FPB	D	3	Y	
Long-legged Myotis (Myotis volans)	XC, BSP, U, FPB	D	3	Y	
Mountain Lion (Felis concolor)	Game	D	1	Y	
Pacific Fisher (Martes pennanti pacifica)	XC, C, BSO	U	1	N	
Pacific Pallid Bat (Antrozous pallidus)	V, BT	D	3	Y	
Pacific Townsend's Big-eared Bat (Corynorhinus townsendii)	XC, C, BSO	D	3	Y	
Red Tree Vole (Arborimus longicaudus)	S&M	D	3	Y	
Ringtail (Bassariscus astutus)	BTO, U	D	1	Y	
Roosevelt Elk (Cervus canadensis)	Game	D	1	Y	
Silver Haired Bat (Lasionycteris noctivagans)	BTO, U	D	3	Y	
Yuma Myotis (Myotis yumanensis)	XC, BSP	D	3	Y	
White-footed vole (Arborimus albipes)	XCO, BSPO, U	S	1	U	
INVERTEBRATES					
Alsea Ochrotichian Micro Caddisfly (Ochrotrichia alsea)	XCO, BS	S	1	U	
American Boreostolus Bug (Boreostolis americanus)	BTO	U	1	U	
Ashlock-Obrien's Seed Bug (Malezonotus obrieni)	BTO	U	1	U	
Blue-gray Taildropper (Prophysaon coeruleum)	S&M, BTO	D	3	Y	
Boreal Carduastethus Pirate Bug (Cardiastethus borealis)	BTO	U	1	U	
Brown Juga (Juga sp. nov.)	BTO	U	1	U	
California Clubtail Dragonfly (Gomphus kurilis)	BTO	U	1	U	
California Floater (Anodonta californiensis)	BSP, XC	S	1	U	
California Giant Damselfly (Archilestes californica)	BTO	U	1	U	
California Stellarid Bug (Vanduzeeina borealis californicus)	BTO	U	1	U	
Cascades Apatanian Caddisfly (Apatania tavala)	BSPO, XCO	S	1	U	
Cooley's Acalypta Lace Bug (Acalypta cooleyi)	BTO	U	1	U	
Coronis Fritillary Butterfly (Speyeria coronis coronis)	BTO	U	1	U	

Terrestrial and Aquatic Animal Species Present in the Roseburg BLM District and Expected Presence in the Lower South Umpqua WAU.					
Species	**Status**	**Presence in District**	**District Monitoring Level**	**Expected in the WAU**	**Expected in Project Area****
Crater Lake Tightcoil (Pristiloma arcticum crateris)	S&M, BSO	S	1	U	
Dendrocoris Stink Bug (Dendrocoris arizonensis)	BTO	U	1	U	
Denning's Agapetus Caddisfly (Agapetus denningi)	XCO, BS	U	1	U	
Deschutes Sideband (Monadenia fidelis ssp. nov.)	BSO	U	3	U	
Disc Oregonian (Cryptomastix sp. nov.)	BSO	U	1	U	
Douglas-fir Platylyngus Bug (Platylyngus pseudotsugae)	BTO	U	1	U	
Essig’s Macrotylus Plant Bug (Macrotylus essigi)	BTO	U	1	U	
Fender’s Blue Butterfly (Icaricia icaroides fenderi)	FE	S	1	U	
Fender’s Rhyacophilan Caddisfly (Rhyocophila fenderi)	BTO	U	1	U	
Foliaceous Lace Bug (Derephysia foliacea)	BTO	U	1	U	
Franklin's Bumblebee (Bombus franklini)	XCO, BSO	S	1	U	
Garita Skipper Butterfly (Oarisma garita)	BTO	U	1	U	
Gold-hunter’s Hairstreak Butterfly (Satyrium auretorium)	BTO	U	1	U	
Gray-Blue Butterfly (Agriades glandon podarce)	BTO	U	1	U	
Green Sideband (Monadenia fidelis beryllica)	BSO	D	3	Y	
Hatch’s Snail-eating Carabid Beetle (Scaphinotus hatchi)	BTO	S	1	U	
Hotspring Physa (Physella sp. nov.)	BSO	U	1	U	
Indian Ford Juga (Juga hemphilli ssp. nov.)	BSO	U	3	U	
Indian Paintbrush Bug (Polymerus castilleja)	BTO	S	1	U	
Insular Blue Butterfly (Plebejus saepiolus insulanus)	BSO	S	1	U	
Lillianis Moss Bug (Acalypta lillianis)	BTO	U	1	U	
Marsh Ground Beetle (Acupalpus punctulatus)	BTO	U	1	U	
Marsh Nabid Bug (Navicula propinqua)	BTO	U	1	U	
Montane Bog Dragonfly (Tanypteryx hageni)	BTO	U	1	U	
Mt. Hood Brachycentrid Caddisfly (Eobrachycentrus gelidae)	BSPO, XCO	D	1	U	
Oregon Acetropis Bug (Ceratpcapsus oregana)	BTO	U	1	U	
Oregon Cave Amphipod (Stygobromus oregonensis)	BTO	U	1	U	
Oregon Giant Earthworm (Driloleirus macelfreshi)	BSO, XCO	S	1	U	
Oregon Halticotoma Plant Bug (Halticotoma sp. nov.)	BTO	U	1	U	
Oregon Megomphix (Megomphix hemphilli)	S&M, BSO	D	3	Y	
Oregon Shoulderband (Helminthoglypta hertleini)	S&M, BSO	D	3	Y	
Oregon Trunk-inhabiting Plant Bug (Eurychilopterella sp. nov.)	BTO	U	1	U	
Pale Teratocoris Sedge Bug (Teratocoris paludum)	BTO	U	1	U	
Papillose Taildropper (Prophysaon dubium)	S&M, BTO	D	3	U	
Piper’s Carabid Beetle (Nebria piperi)	BTO	U	1	U	

Terrestrial and Aquatic Animal Species Present in the Roseburg BLM District and Expected Presence in the Lower South Umpqua WAU.					
Species	**Status**	**Presence in District**	**District Monitoring Level**	**Expected in the WAU**	**Expected in Project Area****
Pristine Spring Snail (Pristiloma hemphilli)	BTO	D	1	U	
Puget Oregonian Snail (Cryptomastix devia)	BT	S	1	U	
Rotund Lanx (Lanx subrotundata)	BSO	D	1	U	
Sagehen Creek Goeracean Caddisfly (Goeracea oregona)	BSPO, XCO	S	1	U	
Salien Plant Bug (Criocoris saliens)	BTO	U	1	U	
Schuh's Micranthia Shore Bug (Micracanthia schuhi)	BTO	U	1	U	
Shiny Tightcoil (Pristiloma wascoense)	BTO	S	1	U	
Siuslaw Sand Tiger Beetle (Cicindela hirticollis siuslawensis)	BTO	U	1	U	
Siskiyou Copper Butterfly (Lycaena mariposa)	BTO	U	1	U	
Siskiyou Hesperian (Vespericola sierranus)	BTO	U	1	U	
Small Blue Butterfly (Philotiella speciosa)	BTO	U	1	U	
Tombstone Prairie Farulan Caddisfly (Farula reapiri)	BSPO, XCO	S	1	U	
Travelling Sideband (Monadenia fidelis celethuia)	BSO	S	3	U	
True Fir Pinalitus Bug (Pinalitus solivagus)	BTO	U	1	U	
Umbrose Seed Bug (Atrazonotus umbrous)	BTO	U	1	U	
Vernal Pool Fairy Shrimp (Branchinecta lynchi)	FT	U	1	U	
Vertrees' Ceraclean Caddisfly (Ceraclea vertreesi)	BSPO, XCO	D	1	U	
Vertrees' Ochrotichian Micro Caddisfly (Ochrotrichia vertreesi)	BSPO, XCO	U	1	U	
Western Chrosoma Bug (Chrosoma sp. nov.)	BTO	U	1	U	
Western Ridge Mussel (Gonidea angulata)	BTO	D	1	U	
Western Pearlshell (Margaritifera falcata)	BTO	D	1	U	

** The Expected in Project Area column may be used to create a list of species that may be found in a project area.

STATUS ABBREVIATIONS:	DISTRICT PRESENCE ABBREVIATIONS:
FE -- Federal Endangered	D -- Documented by surveys or identified in the field
FT -- Federal Threatened	S -- Suspected, habitat present
FP -- Federal Proposed	U -- Uncertain
FC -- Federal Candidate	
XCO – Former Federal Candidate in Oregon	
XC -- Former Federal Candidate in Oregon and Washington	**MONITORING LEVELS USED TO DOCUMENT SPECIES PRESENCE:**
CH -- Critical habitat designated	N -- No surveys done or planned
SE -- State Endangered	1 -- Literature search only
ST -- State Threatened	2 -- One field search done
C -- ODFW Critical	3 -- Some surveys completed
V -- ODFW Vulnerable	4 -- Protocol completed
P -- ODFW Peripheral/Naturally Rare	
U -- ODFW Undetermined	
HI -- Species of high interest in the District	
BSP – Provisionally Bureau Sensitive in Oregon and Washington	**EXPECTED IN WATERSHED OR PROJECT AREA ABBREVIATIONS:**
BSPO – Provisionally Bureau Sensitive in Oregon	U -- Unknown
BA -- Bureau Assessment Species in Oregon and Washington	Y -- Expected
BAO -- Bureau Assessment Species in Oregon	N -- Not expected
BTO -- Bureau Tracking species in Oregon	
BT -- Bureau Tracking species Oregon and Washington	
FPB – Northwest Forest Plan Protection Buffer Species	
S&M -- Survey and Manage (SEIS ROD)	
The species status reflects interim guidelines from the Oregon State BLM Office IB-OR-2000-02 (January 25, 2000). March 9, 2000 R. H. Espinosa	

Appendix F

Plants

Appendix F

Table F-1. Survey and Manage Plant Species Suspected to Occur in the Lower South Umpqua WAU.

Species	**Survey Strategy**			
	1	**2**	**3**	**4**
Vascular plants				
Allotropa virgata[d]	X	X		
Aster vialis[d]	X	X		
Bensoniella oregana[d]	X	X		
Cypripedium fasciculata	X	X		
Cypripedium montanum[d]	X	X		
Fungi				
Rare False Truffles				
Gautieria otthii	X		X	
False Truffles				
Rhizopogon truncatus			X	
Chanterelles				
Cantharellus cibarius[d]			X	X
Cantharellus subalbidus			X	X
Cantharellus tubaeformis[d]			X	X
Rare Chanterelle				
Chantharellus formosus	X		X	
Chanterelles - Gomphus				
Gomphus clavatus			X	
Gomphus floccosus[d]			X	
Gomphus kauffmannii			X	

Appendix F

Table F-1. Survey and Manage Plant Species Suspected to Occur in the Lower South Umpqua WAU.

Species	Survey Strategy			
	1	2	3	4
Tooth Fungi				
Hydnum repandum[d]			X	
Hydnum umbilicatum[d]			X	
Rare Resupinates and Polypores				
Gyromitra esculenta[d]			X	X
Gyromitra infula			X	X
Otidea leporina[d]			X	
Otidea onotica[d]			X	
Otidea smithii	X		X	
Sarcosoma mexicana[d]			X	
Sarcosoma eximia			X	
Rare Cup Fungi				
Aleuria rhenana	X		X	
Helvella compressa[d]	X		X	
Helvella maculata	X		X	
Coral Fungi				
Clavicorona avellanea[d]			X	
Jelly Mushroom				
Phlogoitis helvelloides[d]			X	X
Lichens				
Rare Leafy (arboreal) Lichens				
Hypogymnia duplicata	X	X	X	

Appendix F

Table F-1. Survey and Manage Plant Species Suspected to Occur in the Lower South Umpqua WAU.

Species	Survey Strategy			
	1	2	3	4
Rare Nitrogen-Fixing Lichens				
Lobaria hallii[d]	X		X	
Pseudocyphellaria rainierensis	X	X	X	
Nitrogen-fixing Lichens				
Lobaria oregana[d]				X
Lobaria pulmonaria[d]				X
Lobaria scrobiculata[d]				X
Pseudocyphellaria anomala[d]				X
Pseudocyphellaria anthraspis[d]				X
Pseudocyphellaria crocata[d]				X
Sticta limbata[d]				X
Sticta fuliginosa[d]				X
Pannaria saubinettii[d]				X
Peltigera collina[d]				X
Nephroma resupinatum[d]				X

d = Species documented as occurring in the South River Resource Area.

Survey Strategies:
1= Manage Known Sites
2= Survey Prior to Activities and Manage Sites
3= Conducts Extensive Surveys and Manage Sites
4= Conduct General Regional Surveys

Appendix G

Roads

Table G-1. Roads in the Lower South Umpqua WAU to Consider Decommissioning.

Road Number	Miles	Surface Type	Subwatershed
27-4-35.0C	0.39	Rock	Deer Creek
27-4-35.1A	0.09	Natural	Deer Creek
27-4-35.1B	0.09	Natural	Deer Creek
27-4-35.2B	0.19	Natural	Deer Creek
28-4-8.1E	0.75	Rock	Deer Creek
28-4-8.4C	0.37	Natural	Deer Creek
28-4-9.1A	0.43	Rock	Deer Creek
Total	2.31		

Table G-2. Roads Which Could Be Improved in the Lower South Umpqua WAU.

Road Number	Miles	Surface Type	Subwatershed
27-4-31.0B	0.59	Natural	Deer Creek
28-4-3.0A	0.17	Rock	Deer Creek
28-4-3.0A1	0.54	Rock	Deer Creek
28-4-3.0B	0.14	Rock	Deer Creek
28-4-3.0C	0.90	Rock	Deer Creek
28-4-5.0H	0.42	Rock	Deer Creek
28-4-5.0R	0.10	Natural	Deer Creek
28-4-5.1B	1.02	Rock	Deer Creek
28-4-8.1C	0.52	Rock	Deer Creek
28-4-8.1D	1.65	Rock	Deer Creek
Total	6.05		

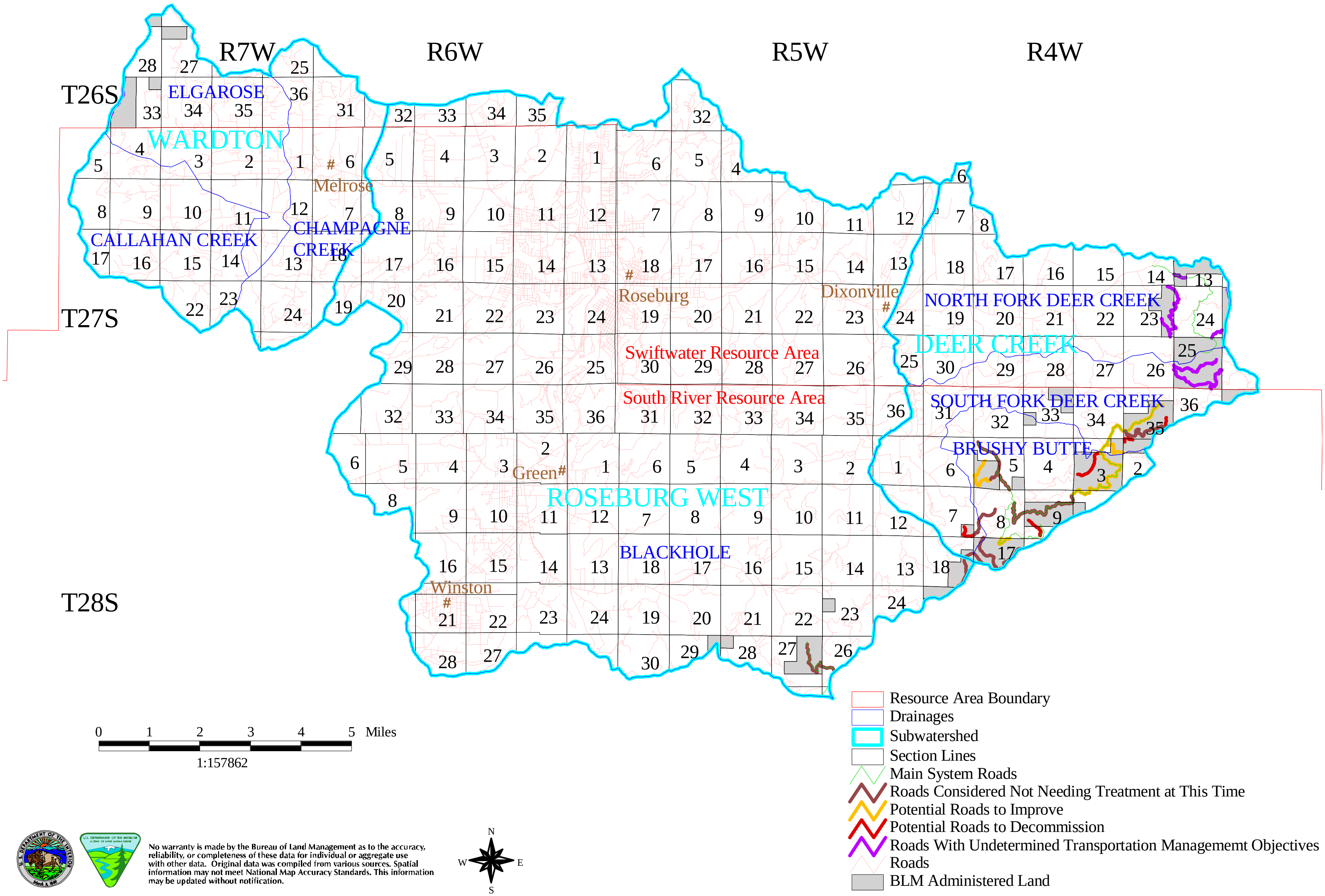
Table G-3. Roads Considered Not Needing Treatment at This Time in the Lower South Umpqua WAU.

Road Number	Miles	Surface Type	Subwatershed
27-4-35.0A	0.08	Rock	Deer Creek
27-4-35.0B	0.97	Rock	Deer Creek
28-4-5.0A	1.41	Bituminous/Rock	Deer Creek
28-4-5.1A	0.20	Rock	Deer Creek
28-4-8.1A	1.82	Rock	Deer Creek
28-4-8.1B	0.48	Rock	Deer Creek
28-4-8.3C	0.77	Rock	Deer Creek
28-4-8.4B	0.87	Rock	Deer Creek
28-4-16.0A1	0.22	Rock	Deer Creek
28-4-17.1A	0.56	Rock	Deer Creek
28-4-18.0A	0.86	Rock	Deer Creek and Roseburg West
28-4-21.0A	1.79	Rock	Deer Creek and Roseburg West
28-4-21.0B	0.80	Rock	Deer Creek
28-5-26.0A	0.41	Rock	Roseburg West
28-5-26.0B	1.00	Rock	Roseburg West
Total	12.24		

Table G-4. Roads in the Swiftwater Resource Area With Unknown Transportation Management Objectives.

Road Number	Miles	Surface Type	Subwatershed
26-7-33.0A	0.86	Rock	Wardton
27-3-19.0A	0.40	Rock	Deer Creek
27-3-19.1A	0.57	Natural	Deer Creek
27-4-13.0A	0.30	Rock	Deer Creek
27-4-14.0B	0.14	Rock	Deer Creek
27-4-15.0B	0.40	Rock	Deer Creek
27-4-15.0D	1.00	Rock	Deer Creek
27-4-15.0E	0.20	Rock	Deer Creek
27-4-15.0G	0.70	Natural	Deer Creek
27-4-23.1A	1.43	Rock	Deer Creek
27-4-25.1A	0.51	Natural	Deer Creek
27-4-25.3A	0.01	Rock	Deer Creek
27-4-25.3C	0.41	Rock	Deer Creek
27-4-26.0B	0.60	Rock	Deer Creek
27-4-26.0C	0.21	Rock	Deer Creek
Total	7.74		

Map G-1. Lower South Umpqua Watershed Analysis Unit
Potential Road Treatment Opportunities



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Appendix H

Aquatic Conservation Strategy and Riparian Reserves

Appendix H
Aquatic Conservation Strategy and Riparian Reserves

The four components of the Aquatic Conservation Strategy are Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration. The Aquatic Conservation Strategy (ACS) was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands. The Aquatic Conservation Strategy seeks to prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds.

Aquatic Conservation Strategy objectives can be associated or linked with the National Marine Fisheries Service (NMFS) Matrix of Pathways and Indicators. The factors and indicators may relate to one or more of the nine ACS objectives. Including the NMFS factors and indicators in an ACS objective consistency discussion may provide a common link and logic track between the ACS objectives and the effects determination of a proposed project on Federally-listed fish species (i.e. Umpqua River cutthroat trout).

When determining whether activities retard or prevent attainment of Aquatic Conservation Strategy objectives, the scale of analysis typically would be BLM analytical watersheds (Fifth Field Watershed) or similar units (USDI 1995). The time period would be defined as decades to possibly more than a century (USDA and USDI 1994b and USDI 1995).

ACS Objective 1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Pathways/Indicators Used in BA Effects Matrix:

Habitat Elements/Off-Channel Habitat
Habitat Elements/Refugia
Channel Condition/Dynamics/Floodplain Connectivity
Watershed Conditions/Road Density and Location
Watershed Conditions/Disturbance History
Watershed Conditions/Riparian Reserves

ACS Objective 2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Temperature
Water Quality/Chemical Contamination/Nutrients
Habitat Access/Physical Barriers
Habitat Elements/Off-channel Habitat
Habitat Elements/Refugia
Channel Condition/Dynamics/Floodplain Connectivity
Flow/Hydrology/Increase in Drainage Network
Watershed Conditions/Riparian Reserves

ACS Objective 3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Pathways/Indicators Used in BA Effects Matrix:

Habitat Elements/Substrate
Habitat Elements/Large Woody Debris
Habitat Elements/Pool Frequency
Habitat Elements/Pool Quality
Habitat Elements/Off-channel Habitat
Channel Condition/Dynamics/Width/Depth Ratio
Channel Condition/Streambank Condition
Channel Condition/Dynamics/Floodplain Connectivity
Watershed Conditions/Road Density and Location
Watershed Conditions/Riparian Reserves

ACS Objective 4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Temperature
Water Quality/Sediment/Turbidity
Water Quality/Chemical Contamination/Nutrients
Watershed Conditions/Riparian Reserves

ACS Objective 5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Sediment/Turbidity
Habitat Elements/Substrate
Habitat Elements/Pool Quality
Flow/Hydrology/Change in Peak/Base Flow
Flow/Hydrology/Increase in Drainage Network
Watershed Conditions/Road Density and Location
Watershed Conditions/Disturbance History
Watershed Conditions/Riparian Reserves

ACS Objective 6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Sediment/Turbidity
Habitat Access/Physical Barriers
Habitat Elements/Large Woody Debris
Habitat Elements/Pool Quality
Habitat Elements/Off-channel Habitat
Channel Condition/Dynamics/Floodplain Connectivity
Flow/Hydrology/Change in Peak/Base Flow
Flow/Hydrology/Increase in Drainage Network

ACS Objective 7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

Pathways/Indicators Used in BA Effects Matrix:

Channel Condition/Dynamics/Floodplain Connectivity
Flow/Hydrology/Change in Peak/Base Flow
Flow/Hydrology/Increase in Drainage Network

ACS Objective 8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Temperature
Water Quality/Sediment/Turbidity
Water Quality/Chemical Contamination/Nutrients
Habitat Elements/Substrate
Habitat Elements/Large Woody Debris
Habitat Elements/Pool Frequency
Habitat Elements/Off-Channel Habitat
Channel Condition/Dynamics/Width/Depth Ratio
Channel Condition/Streambank Condition
Channel Condition/Dynamics/Floodplain Connectivity
Watershed Conditions/Riparian Reserves

ACS Objective 9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Temperature
Water Quality/Sediment/Turbidity
Water Quality/Chemical Contamination/Nutrients
Habitat Access/Physical Barriers
Habitat Elements/Substrate
Habitat Elements/Large Woody Debris
Habitat Elements/Pool Frequency
Habitat Elements/Pool Quality
Habitat Elements/Off-channel Habitat
Habitat Elements/Refugia
Channel Condition/Dynamics/Width/Depth Ratio
Channel Condition/Streambank Condition
Channel Condition/Dynamics/Floodplain Connectivity
Watershed Conditions/Riparian Reserves

Riparian Reserves are associated in the NMFS Matrix of Pathways and Indicators with seven of the nine Aquatic Conservation Strategy objectives. Riparian Reserves generally parallel the stream network, but include other areas necessary for maintaining hydrologic, geomorphic and ecological processes that directly affect streams, stream processes and fish habitats. Riparian Reserves are expected to provide benefits including:

- maintaining streambank integrity (ACS objectives 3, 8 and 9)
- maintaining and recruiting large woody debris and other vegetative debris to provide aquatic habitat and filter suspended sediments. The trapped sediments would absorb and store water. This water would be available during summer months to supplement low summer flows. (ACS objectives 3, 5, 6 and 8)
- the large woody debris would help regulate streamflows by dissipating energy, thus moderating peak streamflows and protecting the morphology of stream channels (ACS objectives 3, 8 and 9)
- providing a nutrient source and water for aquatic and terrestrial species (ACS objectives 2, 4, 8 and 9)
- maintaining shade and riparian climate (ACS objectives 2, 4, 8 and 9)
- providing sediment filtration from upslope activities (ACS objectives 5, 6, 8 and 9)
- enhancing habitat for species dependent on the transition zone between upslope and riparian areas (ACS objectives 1, 2, 4, 8 and 9)
- improving travel and dispersal corridors for terrestrial animals and plants and providing greater connectivity within the watershed (ACS objectives 1, 2, 3, 6 and 8)
- maintaining surface and ground water systems as exchange areas for water, sediment, and nutrients (ACS objectives 2, 4, 6 and 8)
- providing for the creation of and maintenance of pool habitat, both for frequency and quality (ACS objectives 3, 6, 8 and 9)
- providing lateral, longitudinal, and drainage network connections, which include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia (ACS objectives 1, 2, 6, 7, 8 and 9).

Appendix I

Timber Harvesting

Appendix I
Timber Harvesting

A long range timber harvesting plan has been initiated for the South River Resource Area. The timber harvesting planning went through a rigorous process to determine suitable timber harvesting locations. This process continues to be refined.

The first step in the selection process of potential harvest areas was to identify all available and suitable stands. Information from GIS was used to identify Matrix lands greater than 80 years old and not located in reserved areas, such as Riparian Reserves, LSRs, TPCC Nonsuitable Woodland areas, owl core areas, or other administratively withdrawn areas. The remaining available stands were identified as being potential harvest areas. Birthdates (Dk) in the Forest Operation Inventory (FOI) were used to determine which stands were greater than 80 years old.

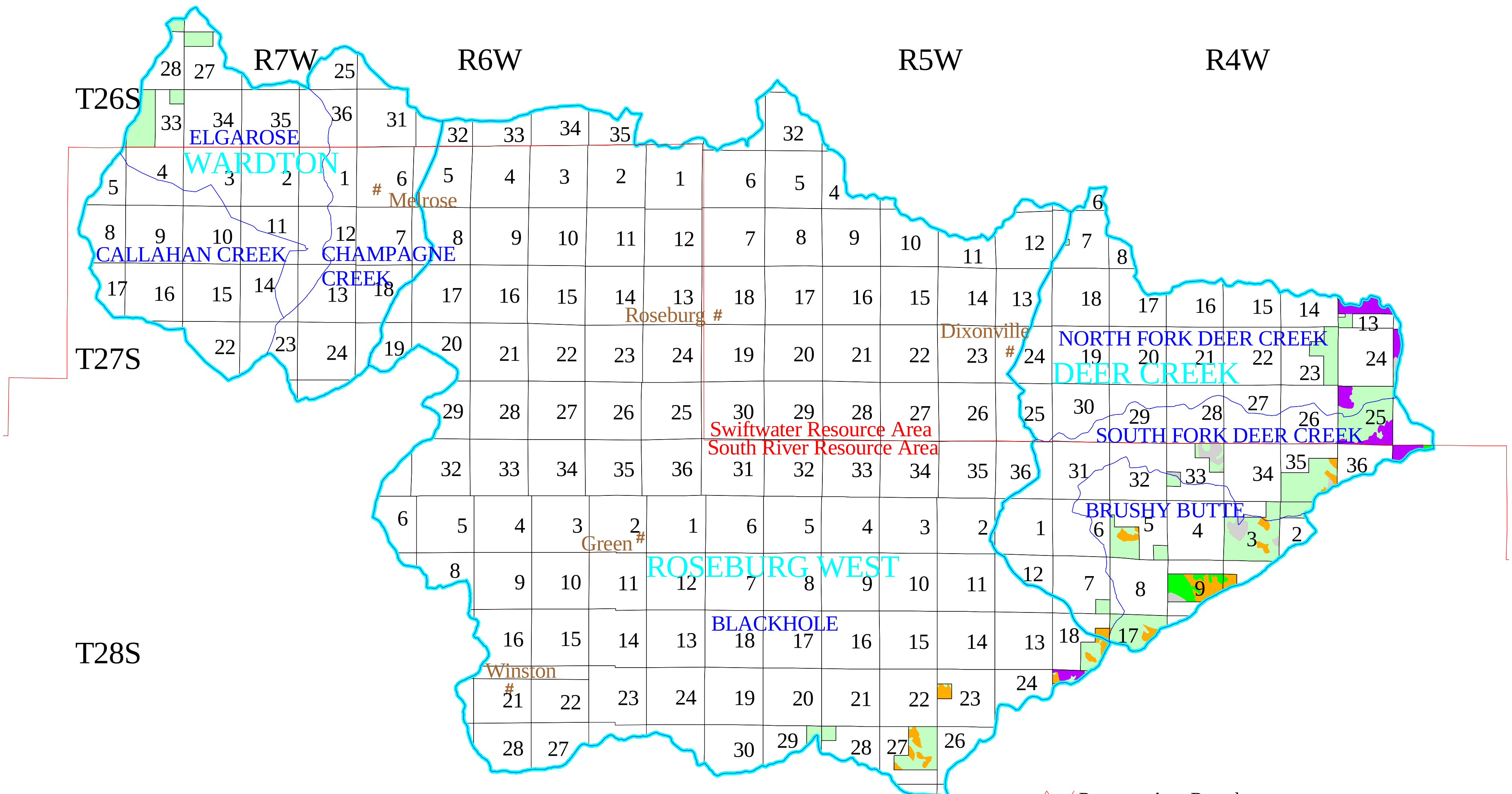
Interpretation of aerial photographs and GIS themes were used to identify suitable harvest areas and define logical unit boundaries. Unit boundaries were established within subwatershed (sixth field watershed) boundaries. Small areas (generally less than two acres) were not mapped as harvestable unless they could be harvested from an existing road. Some stands greater than 80 years old did not appear (as determined by aerial photograph interpretation) to have enough merchantable trees to make a viable unit after retention tree requirements were met. Those areas were not identified for harvesting at this time.

The identified harvest units were digitized into a GIS theme. The digitized harvest units were used to develop a timber sale plan through the year 2024 by attempting to balance timber harvesting equally across all watersheds in the South River Resource Area over time. The timber sale plan assumed timber harvesting would occur in each subwatershed at a level proportional to the number of acres currently available for timber harvesting, with one-third of the available acres in GFMA planned to be harvested in each of the first three decades. Timber harvesting of approximately 1,200 acres per decade was planned within Connectivity/Diversity Blocks in the resource area while maintaining 25 to 30 percent of each Connectivity/Diversity Block in late-successional forests.

Another step was to rank each subwatershed's relative importance to the terrestrial wildlife, hydrology, and fisheries resources. The goals were to identify subwatersheds or areas within a subwatershed where delaying timber harvesting would benefit a resource and what subwatersheds would be impacted the least by timber harvests. In general, subwatersheds with the least amount of BLM-administered land and the fewest available acres for timber harvesting were identified as the places to plan timber harvests first.

The latest step was to evaluate all available timber harvesting units previously identified where harvesting could occur with acceptable impacts to the wildlife, hydrology, and fisheries resources. Potential priority timber harvesting units were areas that did not have obvious conflicts with wildlife, fisheries, or hydrology and were considered to be physically harvestable (see Map I-1). Changes to unit size and shape would be anticipated after extensive field review. Other areas having some concern from wildlife, fisheries, or hydrology, generally, would be considered for timber harvesting after the priority areas. Although, occasions may occur where a lower priority area for timber harvesting may be harvested before a higher priority area, such as if including a lower priority unit in a sale would allow decommissioning of a road facilitating recovery of a larger area.

Map I-1. Lower South Umpqua Watershed Analysis Unit
Potential Harvest Areas on Matrix Land



Resource Area Boundary
Drainages
Subwatershed
Section Lines
Potential Future Commercial Thinnings
Potential 2001 through 2004 Regeneration Harvest Areas
Potential Future Regeneration Harvest Areas
Land Use Allocations
Connectivity/Diversity Blocks
GFMA

0 1 2 3 4 5 Miles

1:158203

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data was compiled from various sources. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

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Appendix J

Soils

Characteristics of Soil Parent Material in the Lower South Umpqua WAU.

Soil characteristics are divided into two groups, surface and subsoil layers. The surface soil layer includes the soil from the surface to a depth of 12 inches. The subsoil soil layer includes the soil from a depth of 12 inches to bedrock or to a depth of 60 inches. The layers are non-disturbed soil weighted averages by layer depth and percent of soil type component. Soil depth and drainage are averaged using both soil layers.

Table J-1. Weighted Average Soil Characteristics by Parent Material.

Geologic Parent Material	% of WAU	Acres	Average Depth (Inches)	Average Drainage (Code)	% Clay Surface Layer	% Clay Subsurface Layer	K Factor Surface Layer	K Factor Subsurface Layer	Available Water Capacity Surface Layer (Inches per Inch)	Available Water Capacity Subsurface Layer (Inches per Inch)
Sandstone and siltstone	26%	29,212	48.47	3.91	25.55	42.44	0.31	0.25	0.19	0.13
Basalt	24%	26,196	21.90	3.06	46.96	49.73	0.26	0.23	0.16	0.14
Clayey alluvium	16%	18,193	61.01	5.41	57.97	60.89	0.21	0.22	0.14	0.12
Metamorphic rock	10%	10,814	29.45	3.01	22.83	29.33	0.23	0.23	0.15	0.14
Mixed alluvium	8%	8,699	62.33	3.33	21.47	27.39	0.29	0.27	0.16	0.15
Sandstone, siltstone and metamorphic rock	8%	8,580	39.38	3.00	24.86	31.42	0.25	0.28	0.14	0.15
Granodiorite	3%	3,037	56.89	2.93	18.43	17.60	0.24	0.18	0.12	0.09
Sandstone	3%	2,869	36.35	3.70	28.47	32.02	0.18	0.17	0.13	0.12
Water	1%	1,024								
Denied Access	1%	810								
Volcanic rock	1%	554	55.78	3.56	27.19	35.68	0.14	0.18	0.12	0.13
Pits	0%	200	0.00				0.00			
Serpentinite and peridotite	0%	151	29.49	3.00	39.61	43.89	0.13	0.11	0.09	0.08
Sandstone and metamorphic rock	0%	53	10.00	2.00	20.00	22.50	0.07	0.10	0.07	0.06
Serpentinized rock	0%	29	60.00	4.00	42.13	48.91	0.06	0.05	0.11	0.09

Table J-1. Weighted Average Soil Characteristics by Parent Material (continued).

Geologic Parent Material	Bulk Density Surface Layer (g/cm^3)	Bulk Density Subsurface Layer (g/cm^3)	% Organic Matter Surface Layer	% Organic Matter Subsurface Layer	pH Surface Layer	pH Subsurface Layer	CEC Surface Layer (meq/100g)	CEC Subsurface Layer (meq/100g)	Permeability Surface Layer (Inches per Hour)	Permeability Subsurface Layer (Inches per Hour)
Sandstone and siltstone	1.40	1.25	2.83	0.81	5.74	5.07	16.75	22.30	0.92	0.48
Basalt	1.39	1.36	2.68	1.78	6.25	6.20	34.32	34.10	0.58	0.12
Clayey alluvium	1.32	1.38	4.12	2.07	6.60	6.62	45.34	43.38	0.24	0.07
Metamorphic rock	1.39	1.40	2.57	0.94	5.72	5.63	14.87	14.69	1.44	1.22
Mixed alluvium	1.30	1.30	3.08	1.13	5.71	5.66	15.47	16.53	1.88	2.17
Sandstone, siltstone and metamorphic rock	1.40	1.37	2.64	1.30	5.72	5.35	15.68	17.05	1.04	0.40
Granodiorite	1.29	0.91	3.44	0.66	6.09	3.66	11.67	5.78	2.89	1.48
Sandstone	1.36	1.36	2.25	1.24	5.89	5.64	20.06	20.42	2.68	2.60
Water										
Denied Access										
Volcanic rock	1.28	1.29	4.51	1.72	5.30	5.01	19.57	18.01	1.54	1.15
Pits										
Serpentinite and peridotite	1.32	1.31	2.11	0.42	6.80	6.90	3.46	3.25	0.21	0.13
Sandstone and metamorphic rock	1.32	1.35	1.50	1.25	6.52	6.30	11.67	12.50	4.00	4.00
Serpentinized rock	1.34	1.44	2.63	1.09	6.54	6.83	15.00	15.00	0.63	0.26

The Natural Resources Conservation Service - National Soil Survey Handbook Part 618 - Soil Properties and Qualities section 430-VI-NSSH (1996) was the source for most of the following information.

Depth: Depths are from the soil surface to weathered (soft) or unweathered (hard) bedrock in inches.

Table J-2. Depth Codes and Description of What the Codes Mean.

Code	Description	Depth to Bedrock (inches)
RO	Rock Outcrop	0 - 4
SHV	Very Shallow	4 - 10
SH	Shallow	10 - 20
MD	Moderately Deep	20 - 40
DP	Deep	40 - 60
DPV	Very Deep	> 60

Drainage: An estimate of the natural drainage class or the prevailing wetness conditions of a soil.

Table J-3. Drainage Class Codes and Description of What the Codes Mean.

Code	Drainage Class	Depth to Water Table (inches)	Permeability	Description
1	Excessively Drained	> 60	Rapid	Water moves through the soil very rapidly. Internal free water is very rare or very deep. Soils are commonly coarse-textured, have very high saturated hydraulic conductivity, and lack redoximorphic features.
2	Some What Excessively Drained	> 60	Moderately Rapid	Water moves through the soil rapidly. Internal free water is very rare or very deep. Soils are commonly coarse-textured, have high saturated hydraulic conductivity, and lack redoximorphic features.
3	Well Drained	40 - 60	Moderate to Slow	Water moves through the soil readily but not rapidly. Internal free water is deep or very deep. Annual duration is not specified. Water is available, in humid regions, to plants during much of the growing season. Wetness does not inhibit root growth for significant periods during most growing seasons. Soils are deep and lack redoximorphic features.
4	Moderately Well Drained	30 - 40	Moderate to Slow	Water moves through the soil slowly during some periods of the year. Internal free water is 20 to 40 inches and may be transitory or permanent. Soil is wet within the rooting depth for only a short time during the growing season. The soil has a moderately low, or lower, saturated hydraulic conductivity class within one meter of the surface or periodically receives high rainfall, or both.
5	Somewhat Poorly Drained	10 - 20	Moderate to Slow	The soil is wet 10 to 20 inches deep for significant periods during the growing season. Internal free water is 10 to 40 inches and transitory to permanent. Mesophytic plant growth is restricted, unless the soil is artificially drained. The soil has a low or very low saturated hydraulic conductivity class, a high water table, receives water from lateral flow, receives persistent rainfall, or some combination.
6	Poorly Drained	4 - 10	Moderate to Slow	The soil is wet 4 to 20 inches deep periodically during the growing season or remains wet for long periods. Internal free water is 4 to 20 inches and common or persistent. Most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously wet beyond eight inches in depth. The soil has a low or very low saturated hydraulic conductivity class or persistent rainfall, or both.
7	Very Poorly Drained	above surface 4 - 10	Rapid to Slow	Water is at or near the soil surface during much of the growing season. Internal free water is 0 to 10 inches and is persistent or permanent. Most mesophytic crops cannot be grown unless the soil is artificially drained. The soil commonly occurs in a depression or level area.

Clay: Measured as soil grain size < than .002 mm in diameter percent by weight.

Table J-4. Percent of Clay by General Soil Type.

Clay Percent	General Soil Type
0 - 10	Sandy
10 - 35	Loamy
> 35	Clayey

K Factor: The soil erodibility factor quantifies the susceptibility of a soil to detachment by water from the whole soil layer including coarse fragments (gravels, cobbles and stones). It is a quantitative value experimentally determined by applying a series of simulated rainstorms on freshly tilled plots. Soil erodibility factors can be estimated using a nomograph, which incorporates the relationships between five soil properties (1) percent silt plus very fine sand, (2) percent sand greater than 0.10 mm, (3) organic matter content, (4) structure, and (5) permeability. Rock fragment content is adjusted separately from the nomograph. The greater the rock fragment content the lower the K factor value. The K factor values obtained experimentally range from 0.02 to 0.69.

Table J-5. The K Factor Groups and Erodibility.

K Factor Groups	Erodibility
0.02 - 0.20	Low
0.21 - 0.40	Moderate
0.41 - 0.69	High

Available Water Capacity: Available Water Capacity is the volume of water available to plants if the soil, including fragments, was at field capacity. It is commonly considered to be the amount of water held in the soil between field capacity and the wilting point, with corrections for salinity, fragments, and rooting depth. Available water capacity classes are used as adjective ratings reflecting the sum of available water capacity in inches to some arbitrary depth. Class limits vary according to climate zone and the crops commonly grown in an area. Available Water Capacity is an important soil property used for developing water budgets, predicting droughtiness, designing drainage systems, protecting water resources, and predicting yields.

Bulk Density: Bulk Density is the oven-dried weight of soil material less than 2 mm in diameter per unit volume of soil at a water tension of 1/10 bar or 1/3 bar. Bulk density influences plant growth and engineering applications. It is used to convert measurements from a weight basis to a volume basis. Bulk density is an indicator of how well plant roots are able to extend into the soil. Bulk density is used to calculate porosity.

Table J-6. Particle Size Classes in Relation to Bulk Density and Root Growth.

Family Particle Size Class	Restriction - Initiation (grams per cm^3)	Root Limiting (grams per cm^3)
Sandy (Sandy)	1.69	> 1.85
Coarse Loamy (Loamy)	1.63	> 1.80
Fine Loamy (Loamy)	1.60	> 1.78
Coarse Silty (Loamy)	1.60	> 1.79
Fine Silty (Loamy)	1.54	> 1.65
Clayey (35 - 45% Clay)	1.49	> 1.58
Clayey (> 45 % Clay)	1.39	> 1.47

Organic Matter: Organic matter is the percent by weight of decomposed plant and animal residue, expressed as a weight percentage of soil material less than 2 mm in diameter. Organic matter influences the physical and chemical properties of soils. It encourages granulation and good tilth, increases porosity, lowers bulk density, promotes water infiltration, reduces plasticity and cohesion, and increases the available water capacity. It has a high cation adsorption capacity and is important for pesticide binding. It furnishes energy to soil microorganisms. Organic matter releases nitrogen, phosphorous, and sulfur as it decomposes.

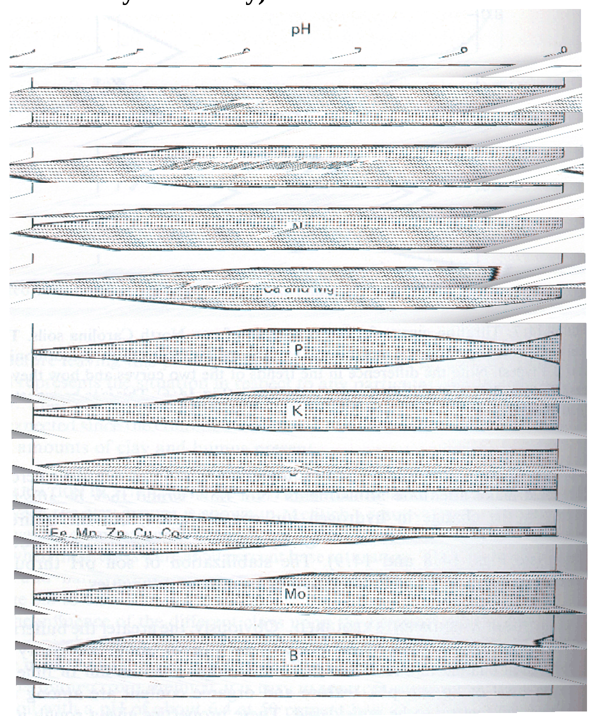
pH: Soil pH is a numerical expression of the relative acidity or alkalinity of a soil.

Figure J-1 shows the relationship in mineral soils between pH, microorganism activity, and the availability of plant nutrients. The wide portions of the bands indicate the pH when microbial activity and nutrient availability are the highest. Generally, pH ranging from six to seven promote plant nutrient availability. If soil pH is optimum for phosphorus, other plant nutrients, if present in adequate amounts, would be available. Acidic soils (with a low pH) have less calcium, magnesium, and molybdenum and more aluminum, iron, and boron available. Acidic soils also have less nitrogen and phosphorus available and possibly more organic toxins. are at the other extreme. Calcium, magnesium, nitrogen and molybdenum are more abundant and aluminum is not toxic with alkaline soils (soils with a high pH). Soils with a pH above 7.9 may have an inadequate availability of iron, manganese, copper, zinc, phosphorus, and boron. Highly alkaline or acidic soils can be very corrosive to steel. Acidic soils, with a pH less than 5.5, are likely to be highly corrosive to concrete. Alkaline soils, with a pH greater than 8.5, are susceptible to dispersion and piping may be a problem.

Table J-7. Descriptions of pH Range of Values.

pH Values	Class Descriptor
1.8 - 3.4	Ultra acid
3.5 - 4.4	Extremely acid
4.5 - 5.0	Very strongly acid
5.1 - 5.5	Strongly acid
5.6 - 6.0	Moderately acid
6.1 - 6.5	Slightly acid
6.6 - 7.3	Neutral
7.4 - 7.8	Slightly alkaline
7.9 - 8.4	Moderately alkaline
8.5 - 9.0	Strongly alkaline
9.1 - 11.0	Very strongly alkaline

Figure J-1. Relationship in Mineral Soils Between pH, Microorganism Activity, and Plant Nutrient Availability (From Nature and Properties of Soils. 8th edition. Nyle C. Brady).



Cation Exchange Capacity: Cation Exchange Capacity (CEC) is expressed as meq/100 g of soil. Cation Exchange Capacity is a measure of the ability of a soil to retain cations, which may be plant nutrients. Soil particles are composed of silicate and aluminosilicate clay. These particles are negatively charged colloids. A cation is a positively charged ion, for example H+, Ca++, Mg++, K+, NH4+, Na+ are all cations. Cations are bound ionically to the surface of the negatively charged colloid particles. Cation Exchange Capacity increases as the clay and organic matter contents increase. Soils with a low Cation Exchange Capacity hold fewer cations and may require more frequent applications of fertilizer and amendments than soils having a high CEC.

Table J-8. Cation Exchange Capacity Values Associated with Soil Types.

Soil Type	Typical CEC Values (meq/100g of soil)
Sand	2 - 4
Loam	7 - 16
Clay	4 - 60
Organic	50 - 300

Permeability: Permeability enables water or air to move through the soil. Values are measured in inches per hour. Historically, the soil survey has used permeability coefficient or permeability as a term for saturated hydraulic conductivity.

Permeability is used in soil interpretations to determine irrigation, drainage system, septic tank absorption fields, terraces and other conservation practices suitability. Permeability is affected by pore size and shape distribution. Texture, organic matter content, mineralogy, structure, matted or absence of roots, pore size, and density are used to estimate permeability.

Table J-9. Relationship of Class Values to Permeability Classes.

Permeability Class	Class Values (inches per hour)	Class Values (um per second)
Very rapid	20 - 100	141 - 705
Rapid	6 - 20	42 - 141
Moderately rapid	2 - 6	14 - 42
Moderate	0.6 - 2	4 - 14
Moderately slow	0.2 - 0.6	1.4 - 4
Slow	0.06 - 0.2	0.42 - 1.4
Very slow	0.0015 - 0.06	0.01 - 0.42
Impermeable	0.00 - 0.0015	0.00 - 0.01